UPPER LLAGAS CREEK
WATERSHED PROJECT
ENGINEERING APPENDIX

TC
425
L52.U6
1981

601
UP

1.5.601
UP

I. D. NO.	MISC. I. D. NO.	COPY
150601	UP	01

Upper Llagas Creek Watershed
Project Engineering Appendix
1981 SCVWD

DATE	ISSUED TO	ORG.

FC-50

1.5.601/UP

Upper Llagas Creek Watershed
Project Engineering Appendix
1981 SCVWD

TC425 L52 U6 1981

UPPER LLAGAS

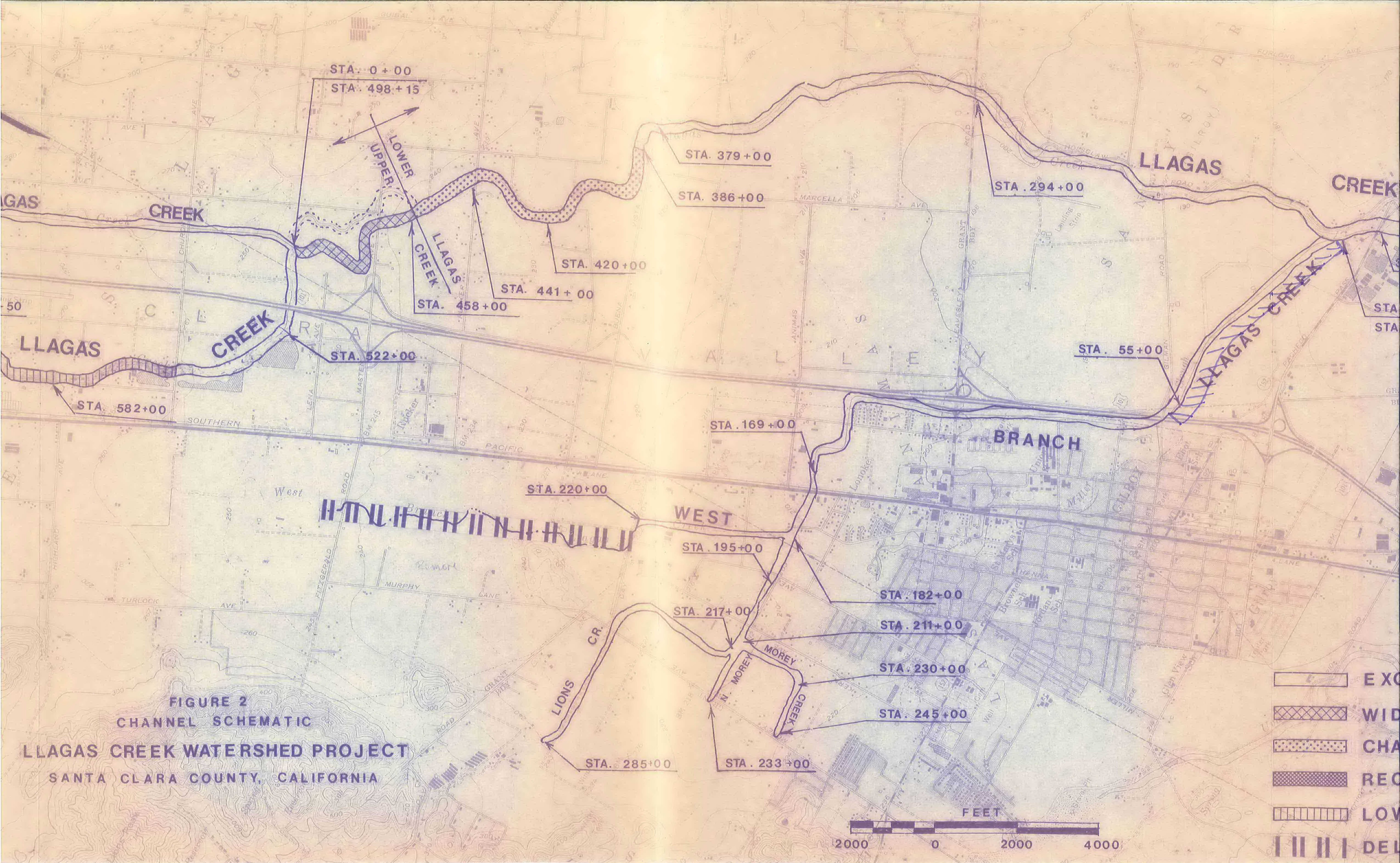

FIGURE 2
CHANNEL SCHEMATIC
LLAGAS CREEK WATERSHED PROJECT
SANTA CLARA COUNTY, CALIFORNIA

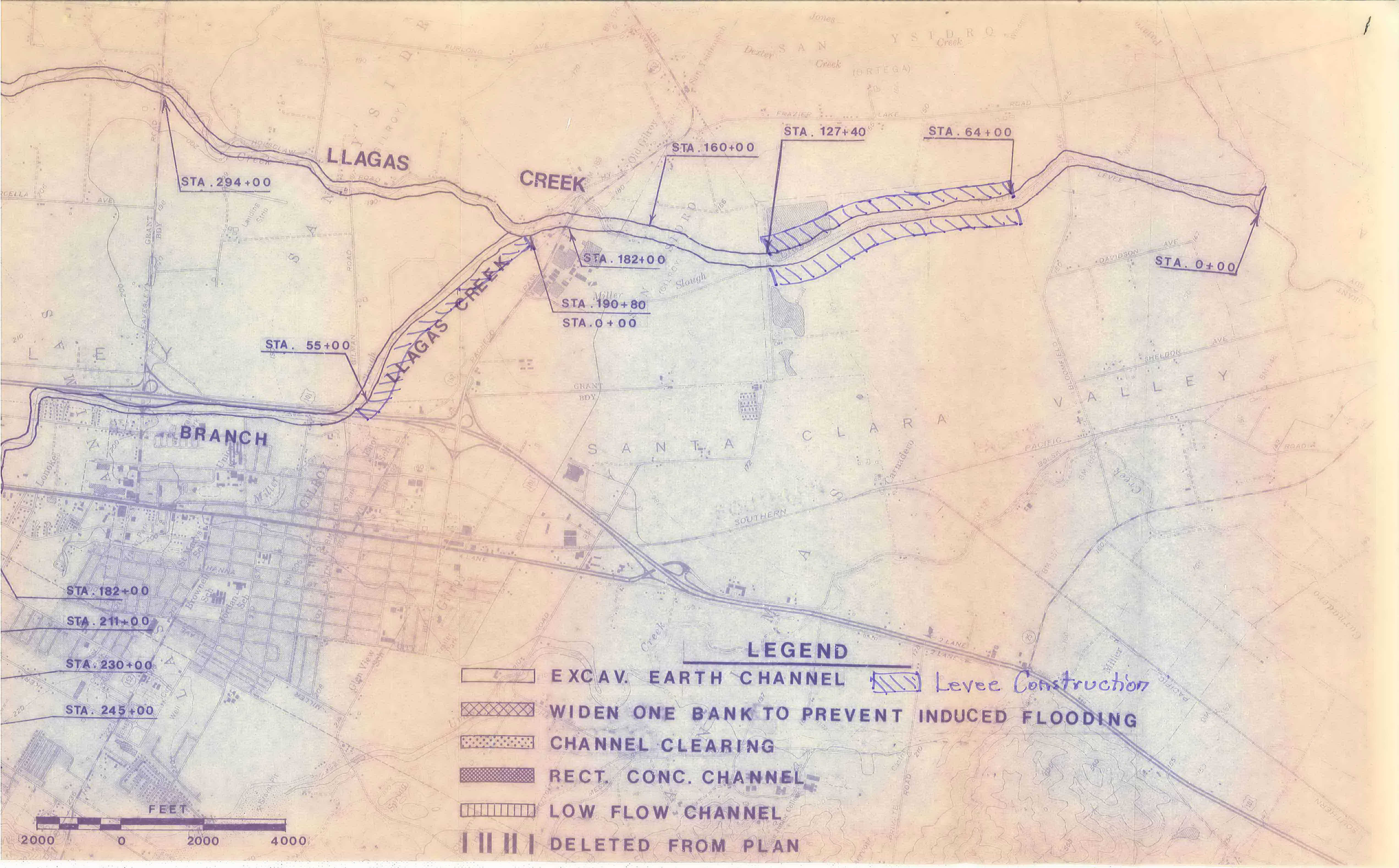
LLAGAS CREEK
STA. 294+00
STA. 160+00
STA. 127+40
STA. 64+00
STA. 0+00
STA. 182+00
STA. 190+80
STA. 0+00
STA. 55+00
LLAGAS CREEK
BRANCH
SANTA CLARA VALLEY
STA. 182+00
STA. 211+00
STA. 230+00
STA. 245+00
LEGEND
EXCAV. EARTH CHANNEL
Levee Construction
WIDEN ONE BANK TO PREVENT INDUCED FLOODING
CHANNEL CLEARING
RECT. CONC. CHANNEL
LOW FLOW CHANNEL
DELETED FROM PLAN
FEET
2000
0
2000
4000

TABLE 1. (Revised) - ESTIMATED PROJECT INSTALLATION COSTS
Upper Llagas Creek Watershed, California

Installation Cost Item	Unit	Number	ESTIMATED COST (Dollars)[1] PL-566 Fund	Other Fund	Total
LAND TREATMENT					
Soil Conservation Service					
Cropland	Ac.	6,862	0	280,000	280,000
Pasture and Hayland	Ac.	1,200	0	22,000	22,000
Rangeland	Ac.	3,000	0	18,000	18,000
Miscellaneous	Ac.	20	0	60,000	60,000
Technical Assistance			40,000	60,000	100,000
Subtotal			40,000	440,000	480,000
Forest Service					
Woodland (Fire Control)	Ac.	16,000	120,000	120,000	240,000
Land Rights			-	70,000	70,000
Technical Assistance			20,000	20,000	40,000
Subtotal			140,000	210,000	350,000
TOTAL LAND TREATMENT			180,000	650,000	830,000[2]
STRUCTURAL MEASURES					
Construction					
Channel Work: N[3]	Mi.	3.9	198,000	0	198,000
M	Mi.	6.8	2,615,000	0	2,615,000
O	Mi.	1.4	617,000	0	617,000
Subtotal Construction			3,430,000	0	3,430,000
Installation Services					
Engineering			514,000	0	514,000
Other			171,000	0	171,000
Subtotal Installation Services			685,000	0	685,000
Other Costs					
Land Rights			0	2,487,000	2,487,000
Relocation Payments			6,000	4,000	10,000
Relocation Assistance Advisory Services			0	1,000	1,000
Subtotal Other Cost			6,000	2,492,000	2,498,000
TOTAL STRUCTURAL MEASURES			4,121,000	2,492,000	6,613,000
TOTAL PROJECT			4,301,000	3,142,000	7,443,000

[1] Price Base 1980

[2] Completed

[3] Type of existing channel: N = An unmodified, well-defined channel; M = Man-made ditch or previously modified channel; O = None or practically no defined channel

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TABLE 2. (Revised) - ESTIMATED COST DISTRIBUTION
Upper Llagas Creek Watershed, California
(Dollars)[1]

			INSTALLATION COST - PL-566 FUNDS					INSTALLATION COST - OTHER FUNDS				
Item Channel Work		Reach	Construction	Installation Engineering	Services Other	Relocation Payments	Total PL-566	Land Rights	Other Costs	Relocation Payments	Total Other	Total Installation Cost
LLAGAS CREEK												
458+00 to 498+15	N[3]	4	132,000	20,000	7,000	0	159,000	6,000	0	0	6,000	165,000
498+15 to 522+00	M	5	196,000	29,000	10,000	0	235,000	31,000	0	0	31,000	266,000
522+00 to 546+70	N	6a	34,000	5,000	2,000	0	41,000	17,000	0	0	17,000	58,000
546+70 to 658+00	M		43,000	6,000	2,000	0	51,000	21,000	0	0	21,000	72,000
658+50 to 714+70	N		32,000	5,000	1,000	0	38,000	15,000	0	0	15,000	53,000
WEST LITTLE LLAGAS												
11+00 to 86+40	O	7a	617,000	92,000	31,000	0	740,000	258,000	23,000	0	281,000	1,021,000
86+40 to 96+40	M		453,000	68,000	22,000	0	543,000	280,000	17,000	0	297,000	840,000
96+40 to 144+00	M	7b	87,000	13,000	4,000	3,000	107,000	584,000	36,000	2,000	622,000	729,000
144+00 to 195+15	M	8a	1,221,000	183,000	61,000	3,000	1,468,000	650,000	78,000[2]	2,000	730,000	2,198,000
195+15 to 227+35	M	8b	10,000	2,000	1,000	0	13,000	34,000	0	0	34,000	47,000
EAST LITTLE LLAGAS												
0+00 to 180+50	M	14	605,000	91,000	30,000	0	726,000	407,000	31,000	0	438,000	1,163,000
TOTAL			3,430,000	514,000	171,000	6,000	4,121,000	2,303,000[4]	185,000	4,000	2,492,000	6,613,000

September 1981

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[1] Price Base 1980
[2] Includes $1,000 relocation advisory assistance services.
[3] Type of existing channel: N = An unmodified, well-defined natural channel; M = Man-made or previously modified channel;
O = None or practically no defined channel
[4] Includes $923,000 for bridges and culverts, and $53,000 for utility relocation and surveys and legal fees.

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TABLE 3A (revised)-STRUCTURAL DATA GRADE STABILIZATION STRUCTURES [1]
Upper Llagas Creek Watershed, California

Site	Drainage Area sq. mi.	Design Capacity (cfs)	Associated Frequency & Duration of Storm	Drop (ft.)	Vol of Concrete (cu. yds.)
Reach 5					
498 + 15 [2]	35.1	4100	10 yr. 24 hr.	2.9	488
Reach 7A					
11 + 00	5.6	2200	100 yr. 24 hr.	3.0	244
Reach 14					
2 + 00	21.4	3830	10 yr. 24 hr.	1.8	488
27 + 00	19.6	3580	10 yr. 24 hr.	5.8	488
83 + 00	14.8	2930	10 yr. 24 hr.	4.0	488
113 + 00	14.8	2930	10 yr. 24 hr.	4.0	488

[1] Concrete volumes and cost estimates based on drop spillway structures.

[2] Structure includes fish ladder

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TABLE 3B. (Revised) - STRUCTURAL DATA - CHANNELS
Upper Llagas Creek Watershed, California

Reach	Channel	Drainage Area sq. ft.	Design Discharge cfs	Channel Gradient ft/ft	Bottom Width ft.	Water Depth ft.	Side Slope	"N" Value		Velocities ft/sec		Excavation Volume cu. yds.	Type[3] of Work	Existing[4] Channel Type	Present[5] Flow Condition
								Aged	As Built	Aged[1]	As Built[2]				
LLAGAS CREEK															
4	458+00 to 498+15	60.5	4,000[8]	0.0025	45	8.7	2:1[11]	.035	.035	7.37	7.37	8,000	III	N	E
5	498+15 to 513+00	35.1	4,100[9]	0.0003	60	8.0	2:1	.035	.035	3.17	3.17	0	II	M(1971)	I
	513+00 to 522+00	35.1	4,100[9]	0.0003	60	8.0	2:1	.035	.035	3.17	3.17	0	II	M(1971)	I
6a	522+00 to 546+70	35.1	4,100[9]	0.0028	50	8.2	2:1	.035	.035	7.64	7.64	22,000	II	N	I
	546+70 to 625+50	35.1	4,100[9]	Construct low flow channel.								[6]	II	M[7]	I
	625+50 to 658+50	33.9	3,800[9]	0.0028	50	7.8	2:1	.035	.035	7.44	7.44	[6]	II	M	I
	658+50 to 687+00	33.1	3,800[9]	0.0028	50	7.8	2:1	.035	.035	7.44	7.44	[6]	II	N	I
	687+00 to 714+70	33.1	3,800[9]	Construct low flow channel.								[6]	II	N	I
WEST LITTLE LLAGAS CREEK															
7 6a	11+00 to 46+50	5.6	2,200[10]	0.0014	55	6.6	2:1	.035	.025	4.84	5.23	176,800	I	O	
	46+50 to 75+50	5.2	2,200[10]	0.0014	55	6.6	2:1	.035	.025	4.84	5.23	[6]	I	O	
	75+50 to 86+40	4.0	1,670[10]	0.0020	41	6.0	2:1	.035	.025	5.32	5.17	[6]	I	O	
	86+40 to 96+40	4.0	1,670[10]	0.0020	41	6.0	2:1	.035	.025	5.32	5.17	[6]	II	M[7]	E
7b	96+40 to 130+20	4.0	1,550[10]	0.0020	31	6.5	2:1	.035	.025	5.37	5.92	16,800	II	M[7]	E
	130+20 to 144+00	3.2	1,050[10]	0.0020	31	5.3	2:1	.035	.025	4.81	5.92	[6]	II	M[7]	E
8a	144+00 to 173+94	2.5	950[10]	0.0030	12	5.7	Vert	.013	.013	13.13	11.46	0	II L	M[7]	E
	173+94 to 195+15	2.5	810[10]	0.0020	12	6.2	Vert	.013	.013	10.75	9.59	0	II L	M[7]	E
8b	195+15 to 206+65	1.5	640[10]	0.0045	12	4.9	2:1	.035	.025	6.12	6.82	2,800	II	M[7]	E
EAST LITTLE LLAGAS CREEK															
14	0+00 to 6+00	21.4	3,830[9]	0.0017	58	8.4	2:1	.035	.035	6.14	6.14	0	II	M(1971)	E
	6+00 to 52+00	19.6	3,580[9]	0.0021	45	8.6	2:1	.035	.035	6.71	6.71	0	II	M(1971)	E
	52+00 to 121+50	14.8	2,930[9]	0.0023	50	7.1	2:1	.035	.035	6.40	6.40	0	II	M(1971)	E
	121+50 to 180+50	6.9	1,450[9]	0.0025	12	8.3	2:1	.035	.035	6.07	6.07	0	II	M(1971)	E

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[1] Velocities associated with design discharge

[2] Velocities associated with 10-year frequency discharge

[3] I = Establish new channel including necessary stabilization measures; II = Enlargement or realignment of existing channel; III = Cleaning out natural or man-made channel (includes bar removal and major clearing and snagging operation)

[4] Type of existing channel: N = An unmodified, well-defined channel; M = Man-made ditch or previously modified channel (approximate date of original construction shown in parentheses); O = None or practically no defined channel

[5] I = Intermittent-continuous flow through some seasons of the year, but little or no flow through other seasons; E = Ephemeral - flows only during periods of surface runoff, otherwise dry

[6] Included in previous entry

[7] Date unknown (prior to 1920)

[8] Existing capacity plus capacity to preclude induced flooding from upstream work

[9] 10-year frequency discharge

[10] 100-year frequency discharge

[11] One sided construction

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TABLE 4. (Revised) - ANNUAL COST
Upper Llagas Creek Watershed, California
(Dollars)[1]

Item	Amortization of Installation Cost[2]	Operation and Maintenance Cost	Total
Structural Measures	224,100	32,200	256,300

[1] Price Base 1980

[2] Amortized over 100 years at 3-1/4 percent

September 1981

6a

Table 5 (Revised) - ESTIMATED AVERAGE ANNUAL DAMAGE REDUCTION BENEFITS

Upper Llagas Creek Watershed, California

(Dollars) [1]

Item	Estimated Average Annual Damage [2]		Damage Reduction Benefits
	Without Project	With Project	
Floodwater & Sediment			
Agriculture	94,800	6,900	87,900
Commercial	116,700	400	116,300
Industrial	100	100	0
Residential	89,300	16,000	73,300
Other Urban	3,500	1,900	1,600
GRAND TOTAL	304,400	25,300	279,100 [3]

[1] Price Base: Agriculture at Current Normalized Prices, all others at 1980 prices

[2] Damages from floods rarer than the 1 percent event were not evaluated

[3] Excludes the effects of accelerated land treatment measures

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Table 6 (Revised) - COMPARISON OF BENEFITS AND COSTS

Upper Llagas Creek Watershed, California

(Dollars)

Evaluation Unit	Average Annual Benefits [1/]			Average Annual Cost [3/]	Benefit Cost Ratio
	Damage Reduction [2/]	Savings in Future Costs	Total		
Upper Llagas	279,100	11,500	290,600	256,300	1.1:1.0

[1/] Price Base: Agriculture at current normalized prices; all others at 1980 prices or actual cost on work completed.

[2/] From Table 5.

[3/] From Table 4.

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Summary of kinds of work by Reach

Reach	Length	Exist Chan	Kind of Work to be done
4	.8	N	Clear & Grub
5	.5	M	Stabilize & Mitigate
6a	1.2	N	Clear & Grub
	1.4	M	Clear & Grub
	1.1	N	Clear & Grub
7a	1.4	O	Trap channel
	.2	M	Trap Channel
7b	.9	M	Trap Channel
8a	1.0	M	Concrete Lined
8b	.2	M	Trap Channel
14	3.4	M	Stabilize & Mitigate

Σ O – 1.4
Σ N – 3.9
Σ M – 6.8
12.1

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Upper Llagas

Summary Construction Cost by Type of Existing Channel

Const Reach	Type of Existing Channel	Construction Cost 566	Other
4	N	132,000 1/	
5	M	196,000 2/	
6a	N	66,000 1/	
	M	43,000 2/	
7a	O	617,000 3/	25,000 4/
	M	453,000 2/	175,000 5/
7b	M	87,000 2/	180,000 5/
8a	M	1,221,000 2/	387,000 5/
8b	M	10,000 2/	
14	M	605,000 2/	156,000 5/
		3,430,000	924,000

1/ 132,000
66,000
198,000

2/ 196,000
43,000
453,000
87,000
1,221,000
10,000
605,000
2,615,000

3/ 617,000

4/ 25,000

5/ 175,000
180,000
387,000
156,000
898,000

198,000
2615,000
617,000
3,430,000

Upper Llagas Creek
Cost Summary

			PL 566										Other				
			1	2	3	4	5	6	7		8	9	10	11		12	13
Reach	Cut	Fill	Concrete	Rock	Vegetation	Misc	Sub Total	12% Contingency	Sub Total	15% Engr	5% ~~4%~~ Adm	Total 566	Other Land Rights	R/W	20% ~~Adm~~ Engr 1/	Total Other	Reach Total
4 upper	40880	980	—	70,000	2880	3442	118182	14182	132364	19855	6618	158837	—	6000	—	6000	164837
5	4820	—	158827	—	2100	9624	175375	21045	196420	29463	9821	235,704	—	31,000	—	31,000	266,704
6 a	91227	—	—	—	2000	3981	97208	11665	108873	16331	5444	130648	—	52796	—	52796	183444
7a	495,116		85400	291,920	—	82662	955098	114612	1,069,710	160456	53485	1,283,652	200469	337,850	40094	578413	1,862,065
7b	46906	—	—	6720	—	24096	77,722	9327	87,049	13057	4352	104,458	180186	403,797	36037	620020	724478
8a	75	58,020	857,750	63,420	—	110885	1,090,075	130,809	1,220,884	183,133	61044	1465061	386,566	263,763	77313	727642	2192703
8b	7784	—	—	—	—	1194	8978	1077	10055	1508	503	12066	—	34,400	—	34400	46466
14			473900	2900	19500	43364	539,664	64760	604424	90664	30221	725,308	156,000 3/	250,700 4/	31,200	437,900	1163208
Total	686733	59000	1,575,877	434960	26,480	279252	3062302	367,477	3,429,779	514467	171488	4115734	923221	1,380,306	184644	2488171	6,603,905
Total																	

1/ Eng - Design 10% Inspection 5% Admin 5%
2/ Previously purchased R/W
3/ Previously constructed bridges at Church and San Martin st.
4/ Purchase by Cal Trans as Borrow Pit
5/ Note does not include relocation payment 2(5000) and relocation advisory service cost of 2(500) in Reaches 7b & 8a.

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Upper Llagas

Cost Summary

Reach	Const	Engr	Total	Land	Const	Engr	Total 1/	Project Total
4	132,364	26,473	158,837	6000	—	—	6000	164,837
5	196,420	39,284	235,704	31,000 2/	—	—	31,000	266700
6a	108,873	21,775	130,648	52,796	—	—	52,796	183,444
7a	1,069,710	213,941	1,283,652	337,850	200,469	40,094	578,413	1,862,065
7b	87,049	17,409	104,458	403,797	180,186	36037	620,020	724,479
8a	1,220,844	244,177	1,465,061	263,763	386,566	77,313	727,642	2,192,703
8b	10055	2011	12,066	34,400	—	—	34,400	46,466
14	604,424	120,885	725,308	250,700 2/	156,000 3/	31,200	437,900	1,163,208
Total	3,429,779	685955	4,115,734	1,380,306	923,221	184,644	2,488,171	6,603,905

1/ Engr. = Design 10%, Inspection 5%, Adm 5%
2/ Previous purchase
3/ Previous Const. of Bridges at Church and San Martin Streets

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Cost Summary

Upper Llagas

Reach	Const	Engr	Total	Land	Const	Engr	Total	Project Total
4	132,400	26,400	158,800	6000	—	—	6000	164,800
5	196,400	39,300	235,700	31,000	—	—	31,000	266700
6a	108,900	21,800	130,700	52,800	—	—	52,800	183,500
7a	1,069,700	213,900	1,283600	337,900	200,500	40,100	578,500	1,862,100
7b	87,000	17,400	104,400	403,800	180,200	36,000	620,000	724,400
8a	1,220,800	244,200	1,465,000	263,800	386,600	77,300	727,700	2,192,700
8b	10100	2,000	12 100	34,400	—	—	34,400	46,500
14	604 400	120,900	725,300	250,700 1/	156,000 2/	31200	437900	1,163,200
Total	3,429,700	685,900	4,115,600	1,380,400	923,300	184,600	2,488,300	6,603,900

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Upper Llagas

Construction Reach	EIS	FONSI	WAD*
4			X
5		Stable X	
6a	X		
7a	X		
7b	X		
8a	X		
8b	X		
14		Stable X	Land + Bridge X

WAD ≡ Work Already Done

12

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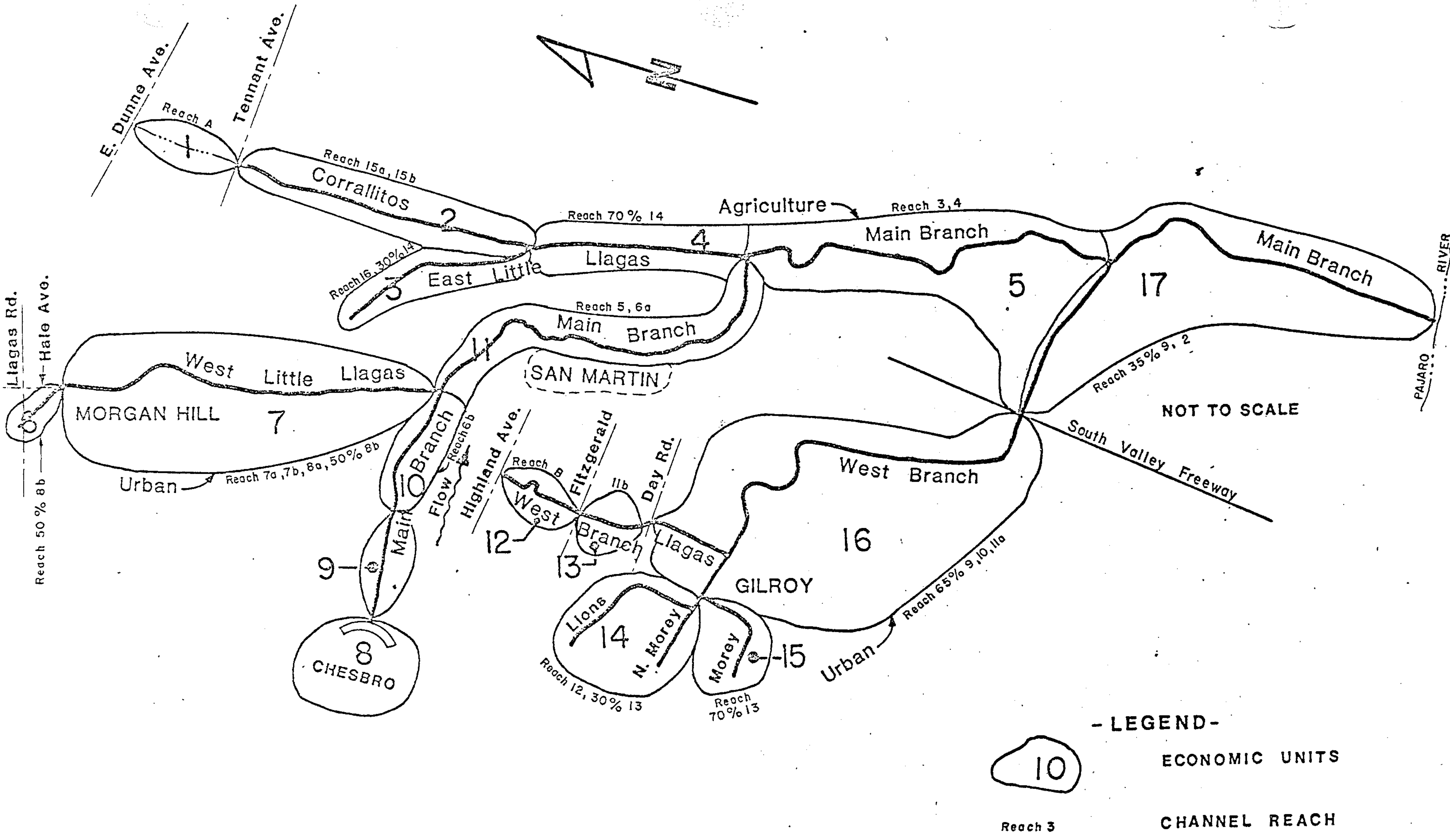
Cost Summary by EIS + Fonsi
Upper Llagas

EIS

Reach	Const	Engr	Total	Land	Const	Engr	Total	Project Total
6a	108,900	21,800	130,700	52,800	—	—	52,800	183,500
7a	1,069,700	213,900	1,283,600	337,900	200,500	40,100	578,500	1862,100
7b	87,000	17,400	104,400	403,800	180,200	36,000	620,000	724,400 +5000
8a	1,220,800	244,200	1,465,000	263,800	386,600	77,300	727,700	2,192,700 +5000
8b	10 100	2,000	12,100	34,400	—	—	34,400	46,500
Total	2,496,500	499,300	2,995,800	1,092,700	767,300	153400	2013400	5,009,200
Work already Done 4	132,400	26,400	158,800	6,000	—	—	6,000	164,800
14				250,700	156,000	31200	437,900	437,900
5				31,000	—	—	31,000	31,000
	132,400	26,400	158,800	287,700	156,000	31,200	474,900	633700
Fonsi 5	196,400	39,300	235,700		—	—	—	235,700
14	604,400	120,900	725,300			—		725,300
Total	800,800	160,200	961,000		—	—	—	961,000
Project Total	3,429,700	685,900	4,115,600	1,380,400	923,300	184,600	2488300	6,603,900



ECONOMIC EVALUATION UNITS

ATTACHMENT 1

FEB 19 1981

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Upper Llagas

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Channel Reach Nomenclature Conversion

Construction Reach #	Economic Reach #
4	5
5	11
6a	11
7a	7
7b	7
8a	7
8b	7
14 (70%)	4
14 (30%)	3

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Channel lengths

Upper Llagas

Construction Reach		Economic Reach	Length (miles)	Summary
4		5	.8	.8
5		11	.5	4.2
6a		11	3.7	
7a		7	1.6	3.7
7b		7	.9	
8a		7	1.0	
8b		7	.2	
14	70%	4	2.4	2.4
14	30%	3	1.0	1.0
			12.1 miles	12.1 miles

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Upper Llagas

Channel Lengths by Type of Work

Const Reach	Econ Reach	Length (miles)	Type Work	Summary
4	5	.8	EIS	
5	11	.5	Fonsi	.5
6a	11	3.7	EIS	
7a	7	1.6	EIS	
7b	7	.9	EIS	8.2
8a	7	1.0	EIS	
8b	7	.2	EIS	
14 (70%)	4	2.4	WAD	3.4
14 (30%)	3	1.0	WAD	
		12.1		12.1

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Upper Llagas
Cost Summary by Economic Reaches

Reach	Const	Engr	Total	Land	Const	Engr	Total	Project Total
7 6/	2,387,600	477,500	2,865,100	1,039,900	767,200	153,400	1,960,500	4,825,600
11	108,900	21,800	130,700	52800	—	—	52,800	183,500
Total	2,496,500	499,300	2,995800	1,092,700	767,200	153,400	2,013,300	5,009,100
WAD								
3 1/				75,200	46,800	9,400	131,400	131,400
4 1/				175,500	109200	21800	306500	306,500
5 2/	132,400	26400	158,800	6,000	—	—	6000	164,800
11 4/				31,000			31000	31,000
Total WAD	132,400	26 400	158,800	287700	156,000	31,200	474,900	633700
Forsi								
3 3/	181,300	36,300	217,600	—	—	—	—	217,600
4 3/	423,100	84,600	507700	—	—	—	—	507,700
11 5/	196,400	39,300	235,700	—	—	—	—	235,700
Total Forsi	800800	160,200	961,000	—	—	—	—	961,000
Total	3,429,700	685,900	4,115,600	1,381,400	923,200	184,600	2,488,200	6,603,800

1/ Bridges and land in construction reach 14
2/ Work in construction 4 Upper Llagas charged to EIS but cost charged to work Already Done (WAD)
3/ Work in construction reach 14
4/ land in construction reach 5
5/ Work in construction reach 5
6/ does not include 11000 relocation payment & advisory service

17

DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Calif
LL Hansen 8/25/81
Spoil Disposal

PROJECT Upper Llagas

Spoil from channel excavation is assumed to be disposed of on lands already in public ownership or on lands dedicated to the county at no cost. Refer to spoil disposal site investigation report of July 1976.

COMPUTATION SHEET

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

STATE Calif Upper Llagas

L L Hansen 8/14/81

OM+R

OM+R has been estimated by SCVWD at $2600/mile see Cost Summary Data

Cost

12.1 miles @ 2600 = $31,460

LLAGAS CREEK WATERSHED PROJECT

20

BRIDGES

34

BRIDGES				EXISTING		PROPOSED		
JURISDICTION	REACH NO.	STATION	TYPE OWNERSHIP	ROADWAY WIDTH	WATER OPENING	ROADWAY WIDTH	WATER OPENING (SPAN)	REMARKS (BRIDGE OR BOX)
COUNTY	1	50+40	STATE	60'	50'	Bloomfield Rd	220	BRIDGE
GILROY	2	127+40	CITY	13'	72'	Sewer Ponds	260'	BRIDGE
		182+00	STATE (152)	32.5'	89.5'	Pacharo Pass	260'	BRIDGE
COUNTY	3	238+00	COUNTY (GILMAN RD.)	22'	59'		154'	BRIDGE
		294+00	COUNTY (LEAVESLEY RD)	31'	48.5'		166'	BRIDGE
MORGAN HILL	7A	30+70	COUNTY (W. MIDDLE AVE)	19'	NO STRUCTURE		TRIP 12X9	RCB
		69+30	COUNTY (WATSONVILLE RD)	25'	NO STRUCTURE		TRIP 12X9	RCB
	new	80+50	CITY (LaCrosse)				TRIP 12x9	RCB *
		88+50	CITY	49.5'	24'		74'	BRIDGE
		96+40	CITY (W. EDMONDSON)	22'	12'		TRIP 10X9	RCB
MORGAN HILL	7B	102+60	PRIVATE				67'	BRIDGE
		104+40	PRIVATE	42'	ELIP 84X54		67'	BRIDGE
new		111+10	PRIVATE	9'	13'		67'	BRIDGE
		116+30	CITY (COSMO AVE)	24'	2-54" CMP		DOUBLE 10X8	RCB
		130+20	CITY (SPRING AVE)	40'	8'		DOUBLE 10X8	RCB
		144+00	CITY (W. DUNNE AVE)	WEST SIDE 55.5' EAST SIDE 67.5'	8.5'		DOUBLE 8X8	RCB
MORGAN HILL	8A	148+50	CITY (W. FIFTH ST.)	40'	7'		DOUBLE 14X8	RCB
		151+20	CITY (FOURTH ST.)	39'	16'		SIN 12X8	RCB (180 Linear Feet)
		156+13	CITY (W. THIRD ST.)	WEST SIDE 22' EAST SIDE 60'	9'		SIN 12X8	RCB
		161+12	22 CITY (DEL MONTE AV.)	40'	7'		SIN 12X8 SIN 2X81/4	RCB RCB
		164+84	CITY (WARREN AVE.)	18'	8'		SIN 12X8	RCB
		173+94	CITY (W. MAIN ST.)	45.7'	9.4'		SIN 12X8	RCB
		195+15	CITY (WRIGHT and HALE)		9.2' RCB & 2-30" CMP		SIN 12X8	RCB
GILROY	9	115+00	COUNTY (LEAVESLEY RD)	WEST SIDE 121' EAST SIDE 130.5'	10'		TRIP 12X9 SIN 10X9	RCB
		147+00	COUNTY (MURRAY AVE)	OLD 20.5'	5'		120'	BRIDGE
		169+00	RAILROAD (MONTEREY RD)		5'		112'	BRIDGE
GILROY	10	170+00	STATE (MONTEREY RD)	71'	NO STRUCTURE		112'	BRIDGE
		192+00	COUNTY (WREN AVE.)	22'	NO STRUCTURE		94'	BRIDGE
GILROY	11A	193+00	COUNTY (FARRELL)	20'	16'		102'	BRIDGE
		220+00	COUNTY (DAY RD.)	21'	16'		96'	BRIDGE
ROY	12	206+00	COUNTY (KERN AVE)	20'	NO STRUCTURE		90'	BRIDGE
		250+00	COUNTY (MOREY AVE)	21'	24"		74'	BRIDGE
GILROY	13	233+50	COUNTY (MOREY AVE)	20'	48"		66'	BRIDGE
		245+00	COUNTY (MOREY AVE)	20'	7.5'		61'	BRIDGE

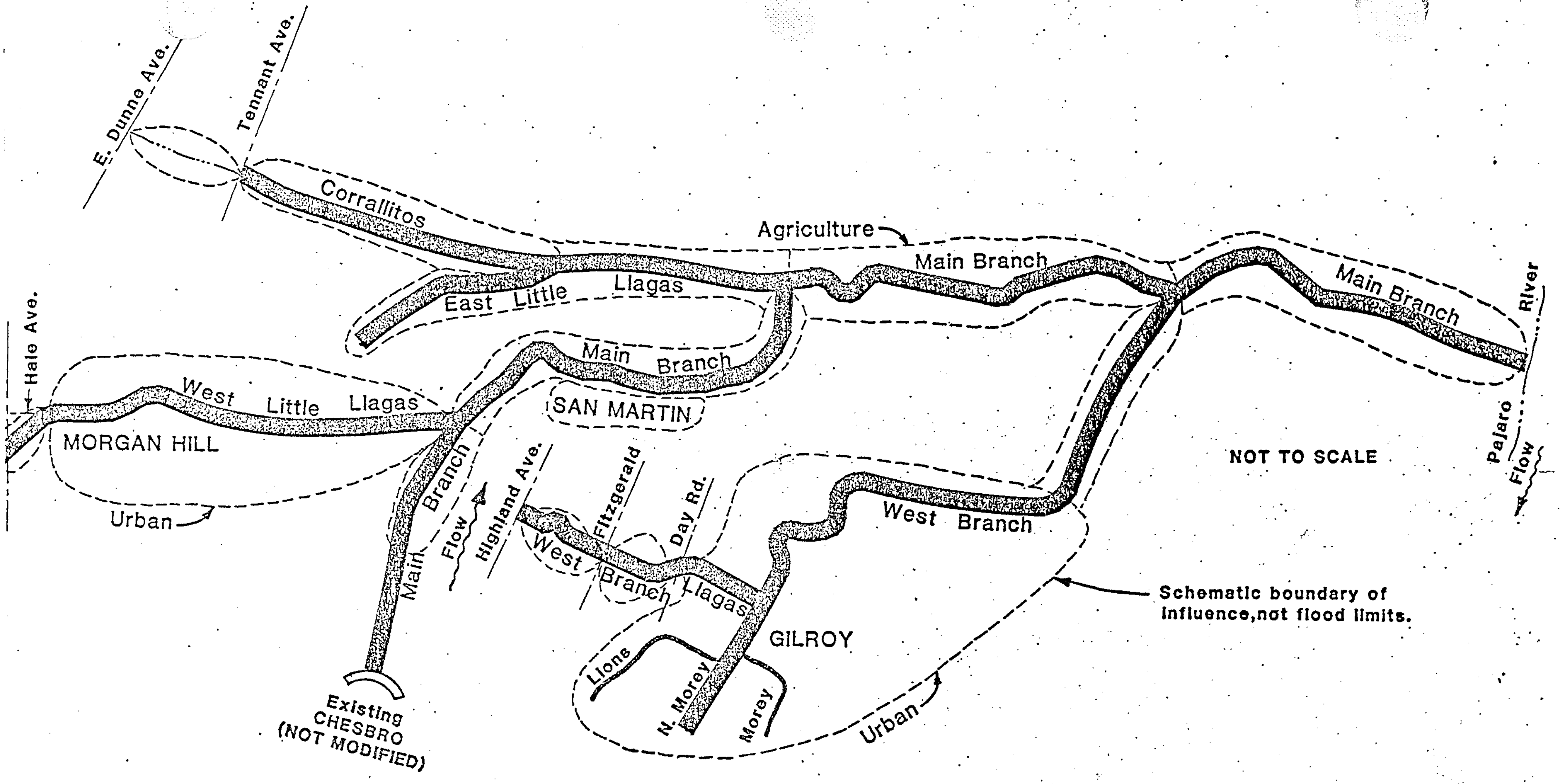
SIN = SINGLE TRIP = TRIPLE

LLAGAS CREEK WA[illegible]SHED PROJECT
LEVELS OF PROTECTION

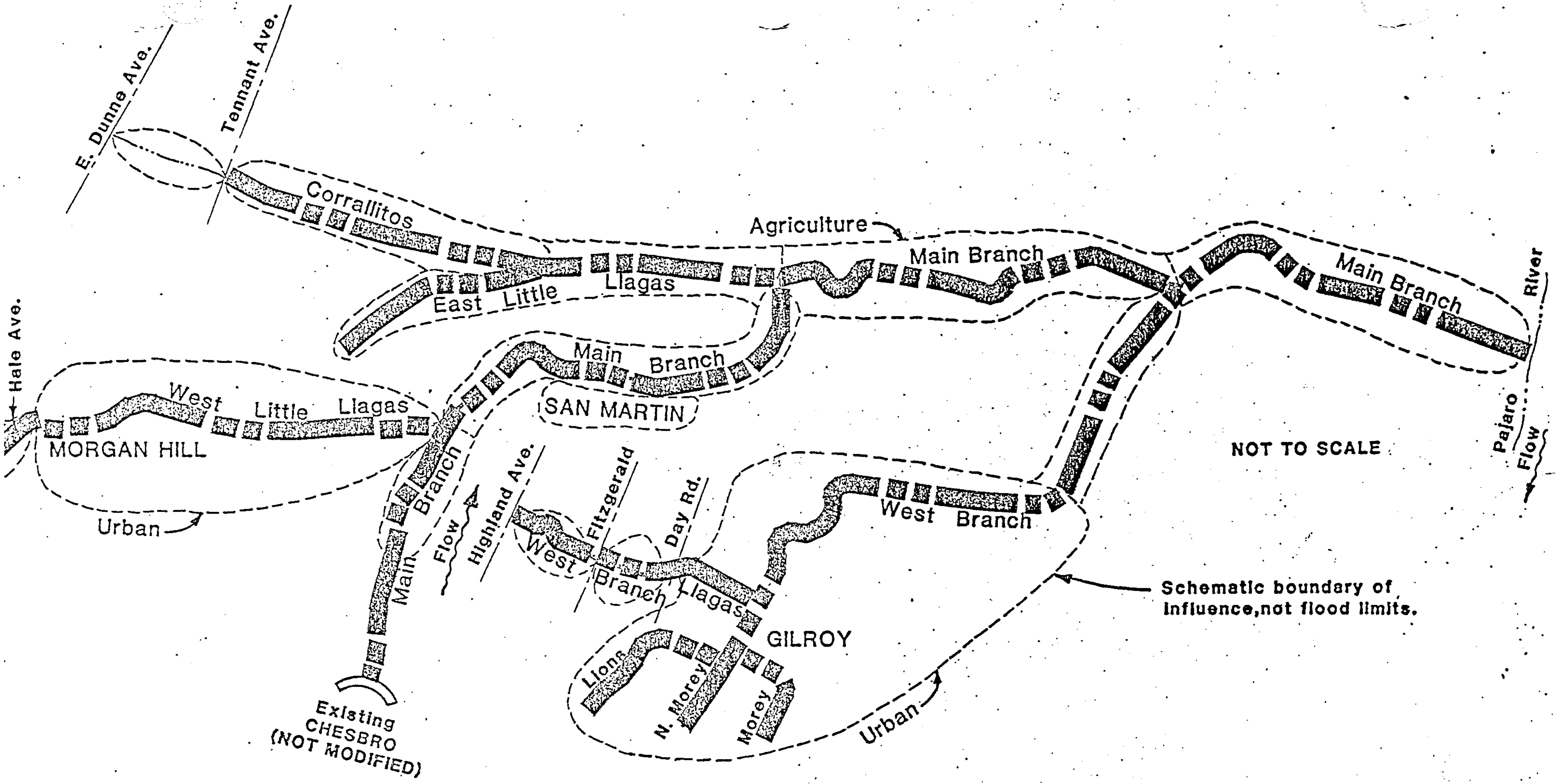
LEGEND

▬	Detailed Damage Analysis-Present Land Use
▬ ▬	Detailed Damage Analysis-Future Land Use

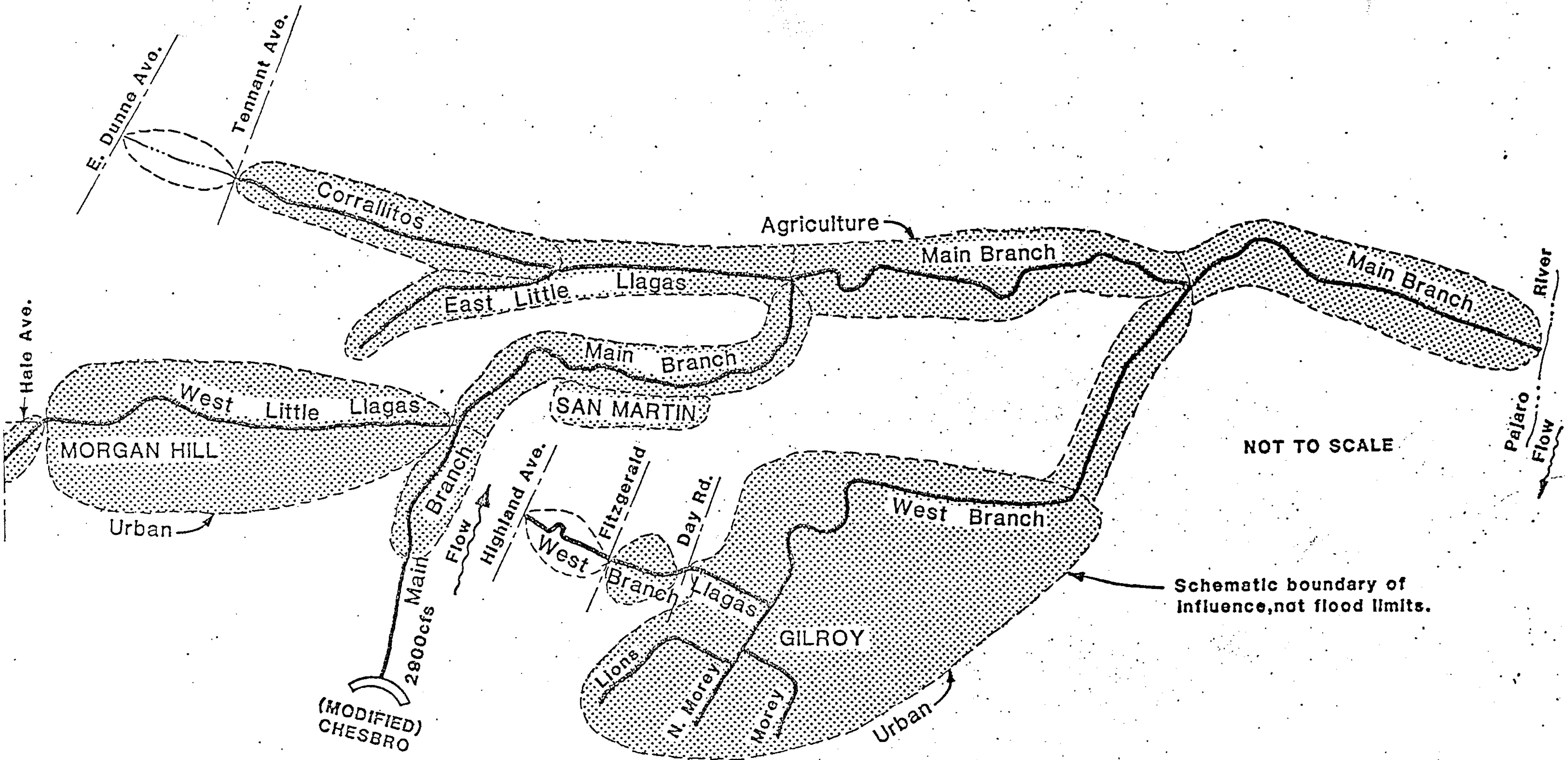
	COST		BENEFITS
░	1% Channel	-	1% Damage Prevented
▧	10% Channel	-	10% Damage Prevented
▨	10% Channel	-	X% Damage Prevented Downstream of a 1% Channel.
▒	1% Channel for Modified Operation of Chesbro (Existing Work Plan Design)	-	Less Than 1% Damages Prevented Because of Extra 1000cfs Due to not Modifying Operation of Chesbro
▧	No Induced Downstream Flooding.Upgrade the Existing Channel Just Enough to Take Extra Flow Caused by Eliminating the 1% Flood Storage in Urban Areas.	-	No Damage Prevented.Also,no Damage Induced.



Detailed Damage Analysis-Present Land Use

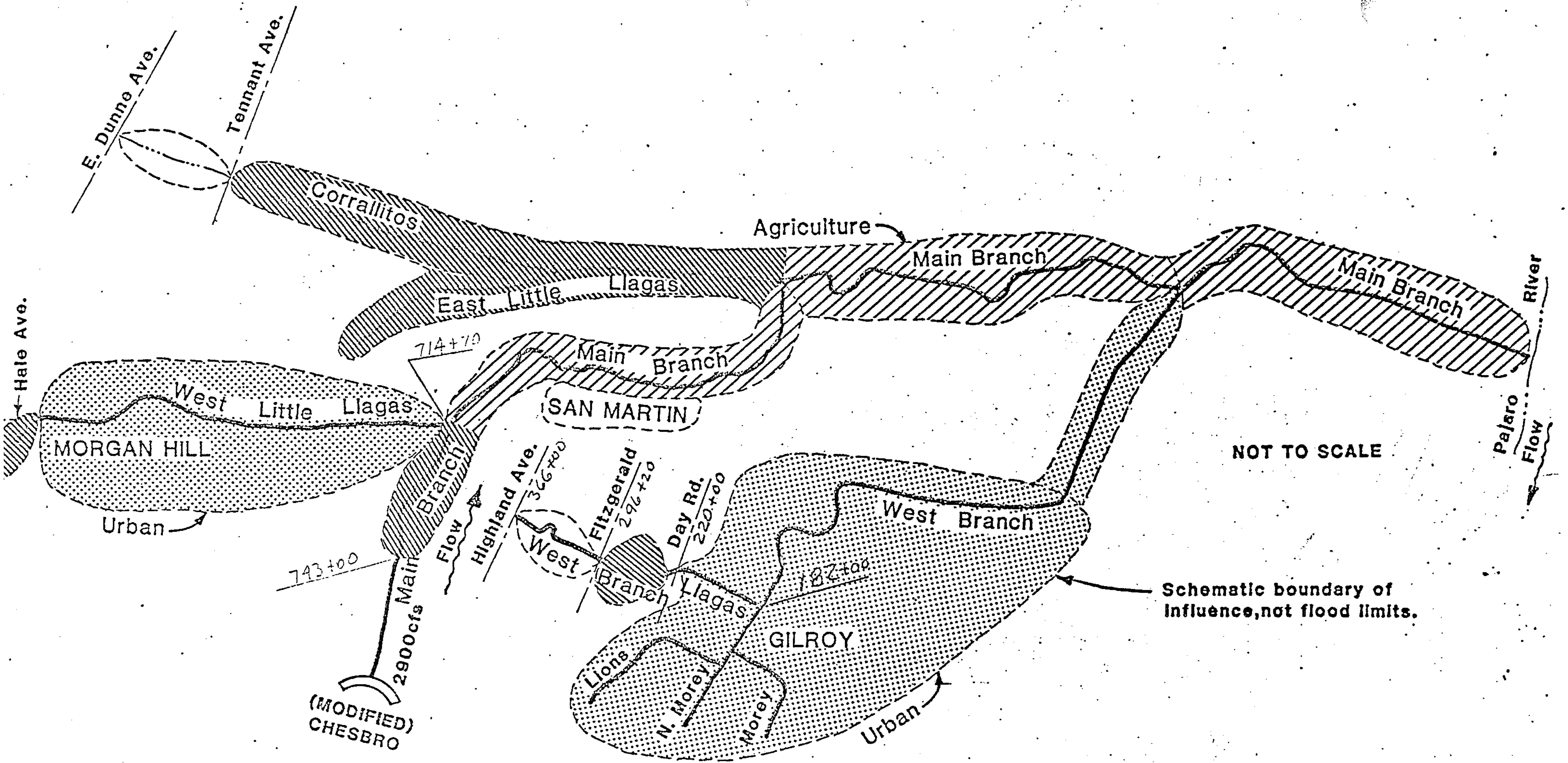


Detailed Damage Analysis-Future Land Use



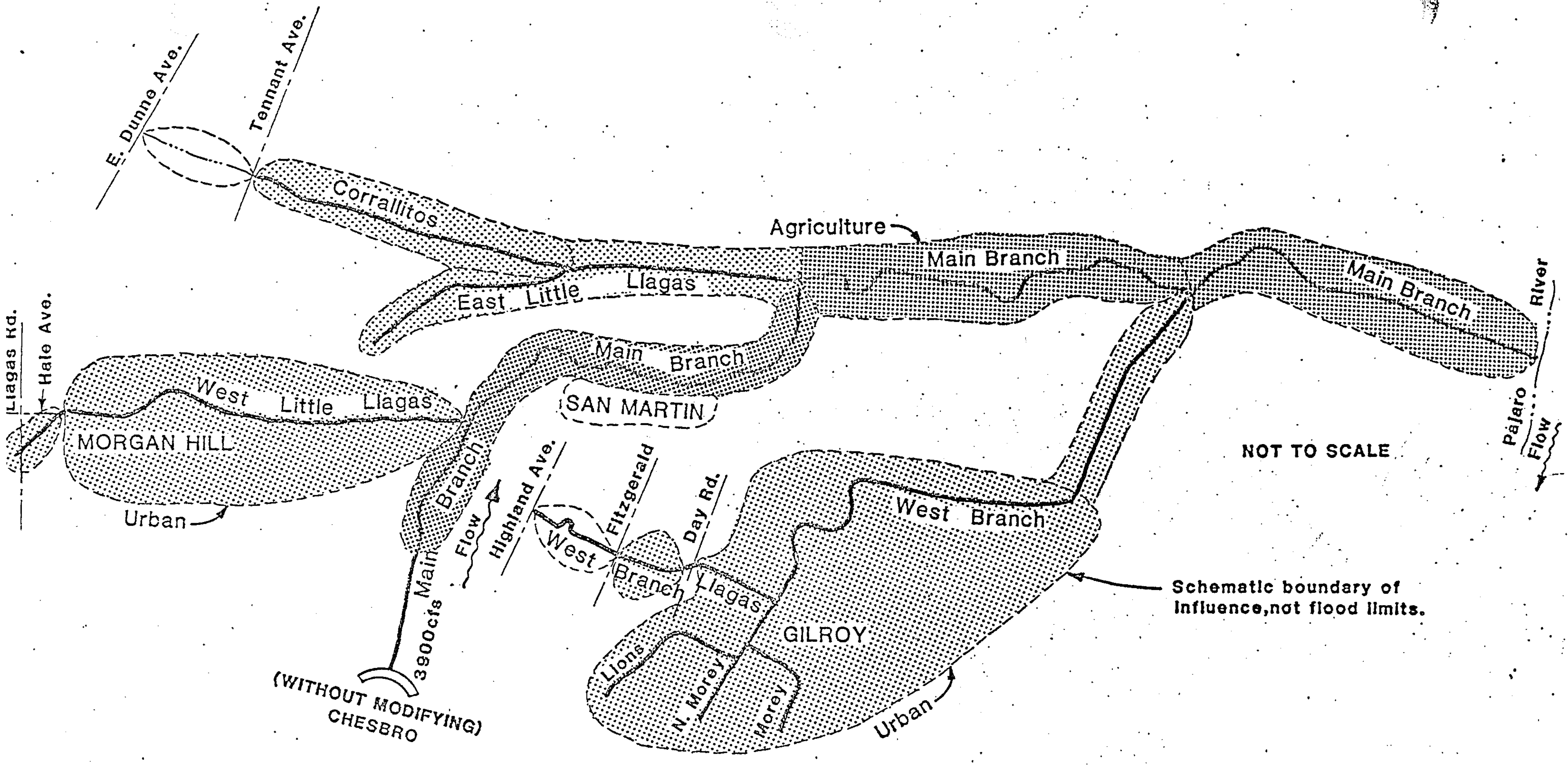
CASE 1

1% Protection Throughout (Original Project Limits Shown on SCS's "Work Plan")



CASE 2

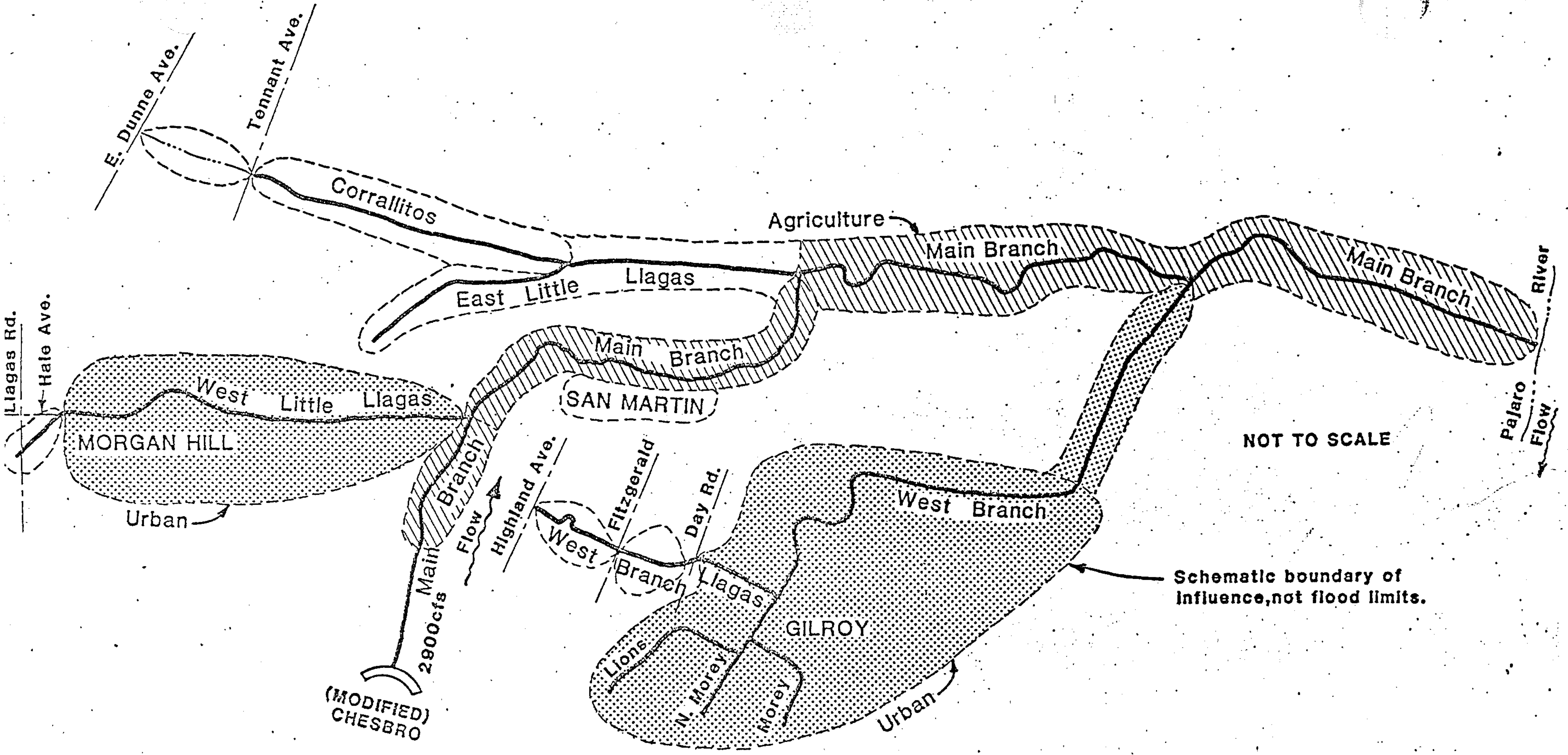
1% Urban-10% Agriculture



CASE 3

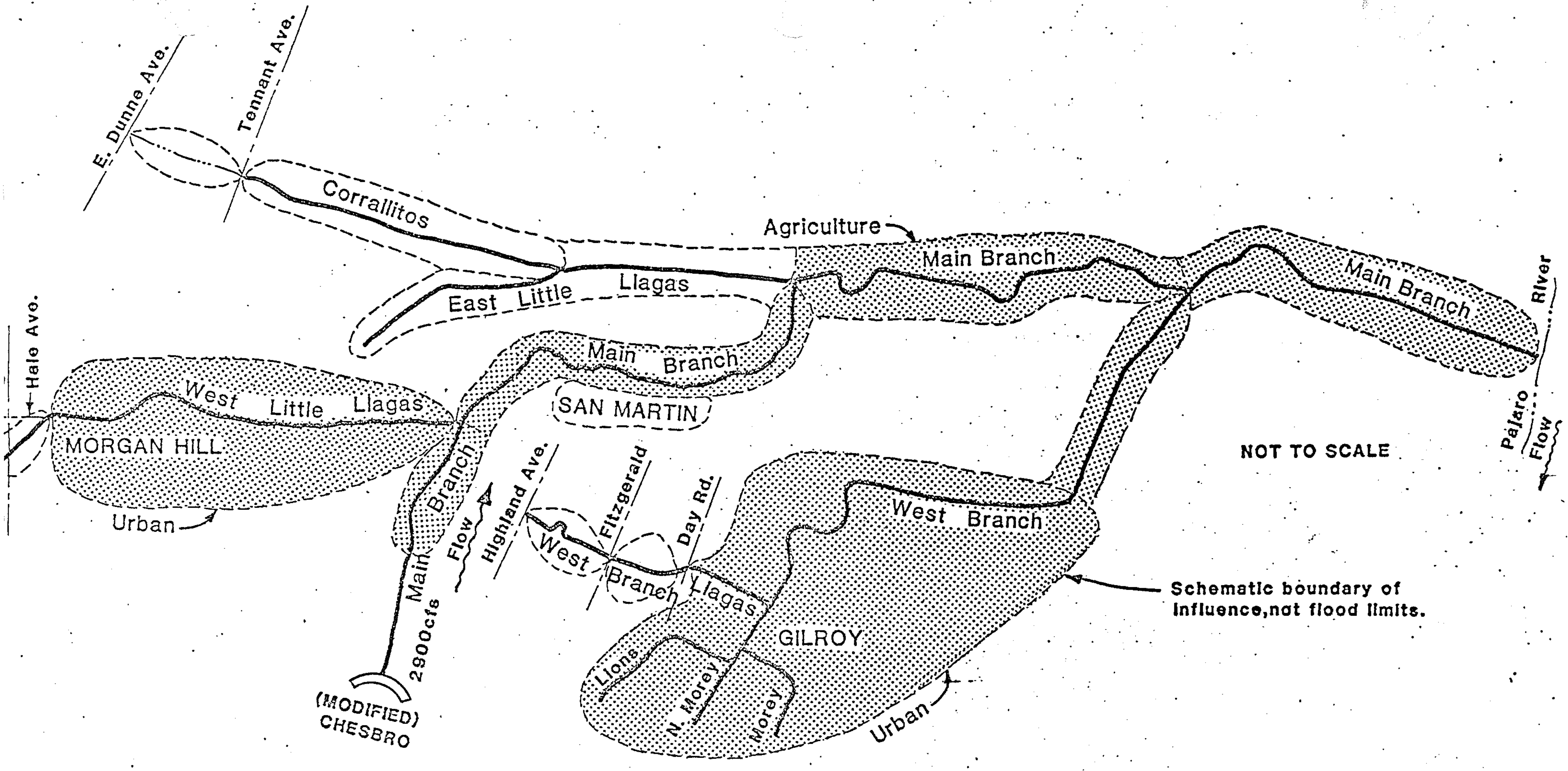
Present Channel Design but Without Modifying the Operation of Chesbro.

26
23



CASE 4

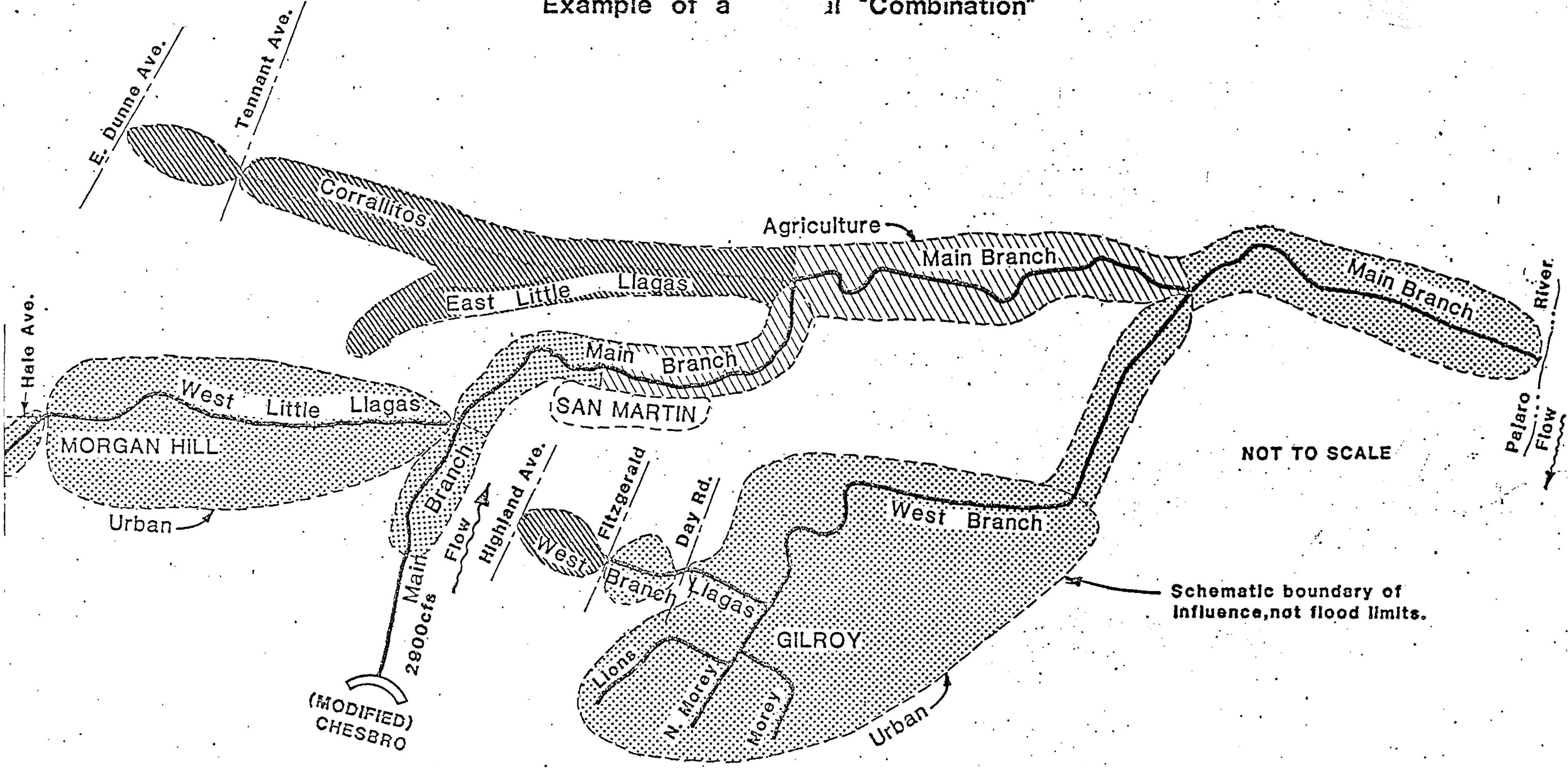
1% Urban-No Induced Downstream Flooding



CASE 5

1% Urban-1% Main Branch Only

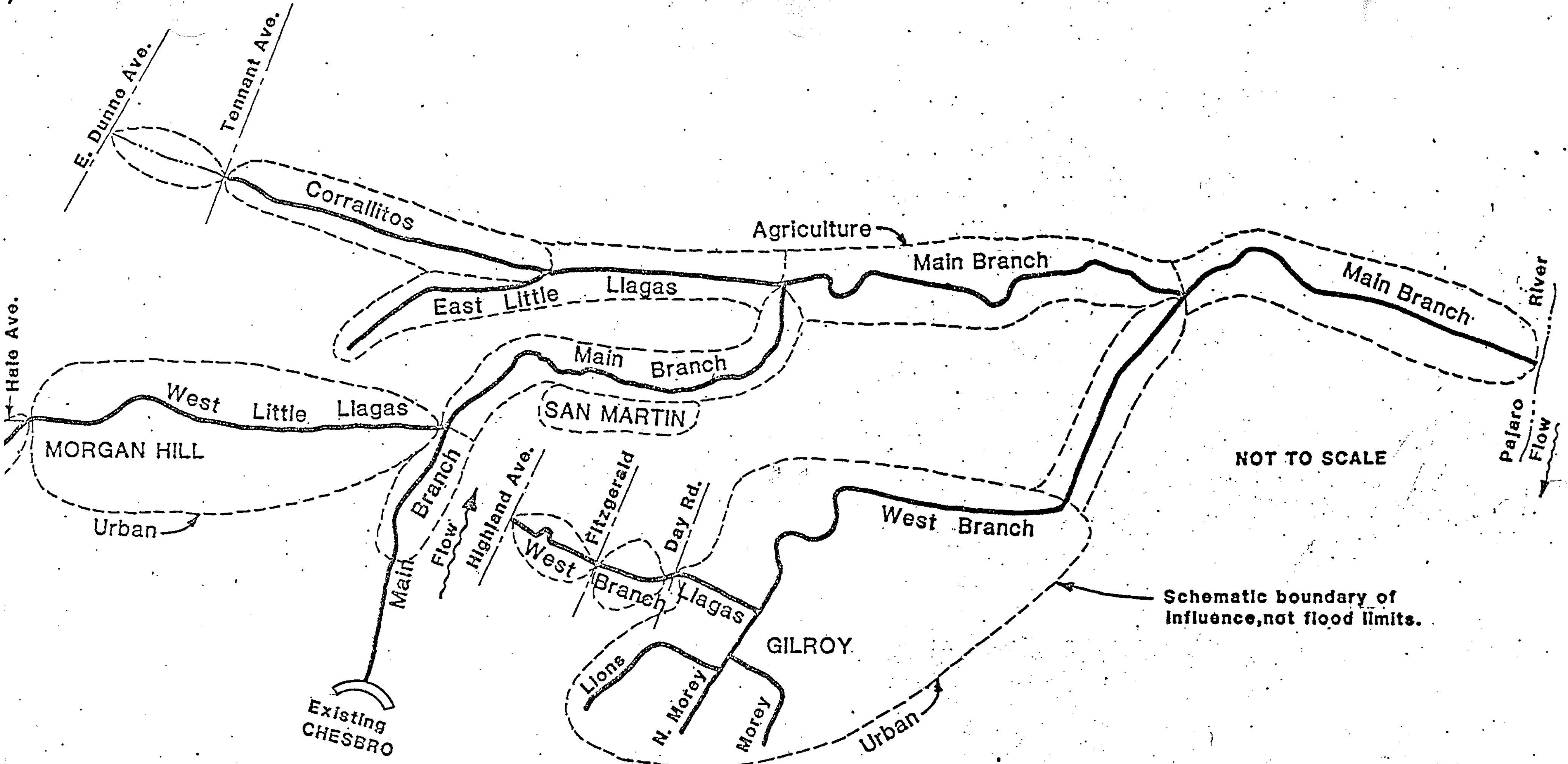
Example of a [illegible]l “Combination”



CASE 6

Typical Combination

The actual combination of “levels of protection” to be investigated will be determined after the cost and benifits for the first five cases are known.

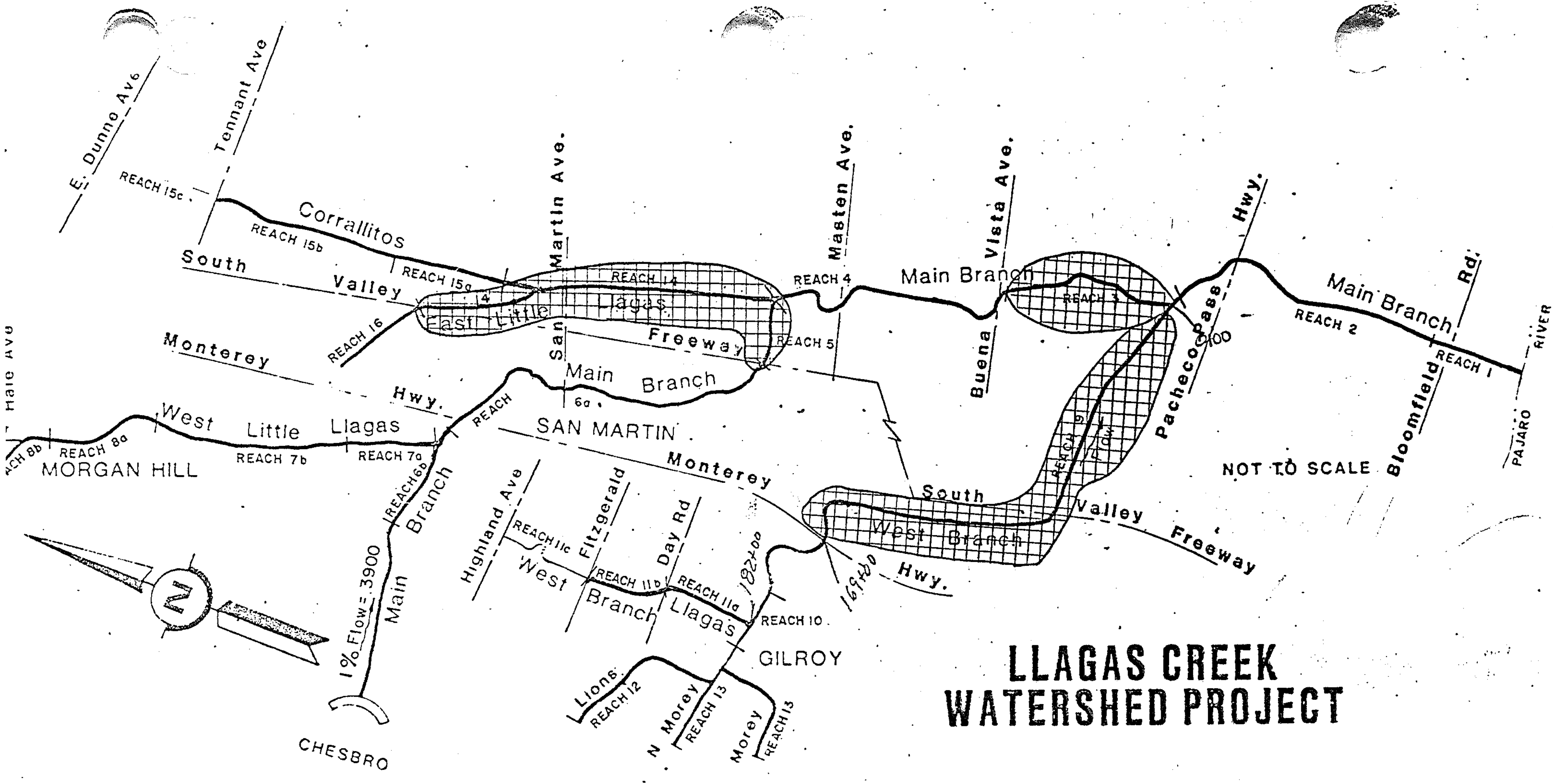


CASE 7

Non-Structural Solution

Examples of non-structural solutions:

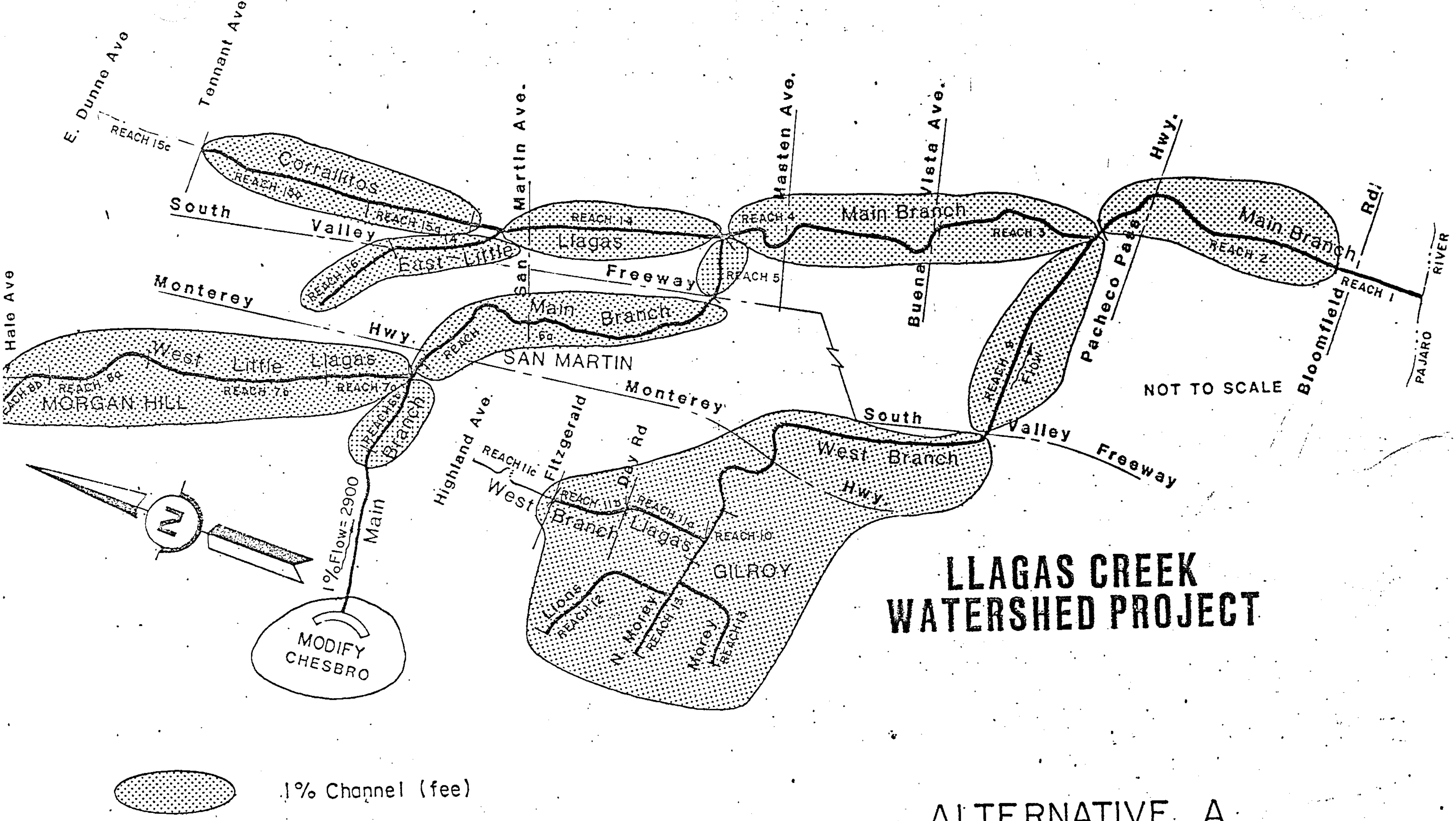
- Flood proofing
- Flood insurance
- Flood warning system
- Relocation of residents from flood plain
- Combination of the above



LLAGAS CREEK WATERSHED PROJECT

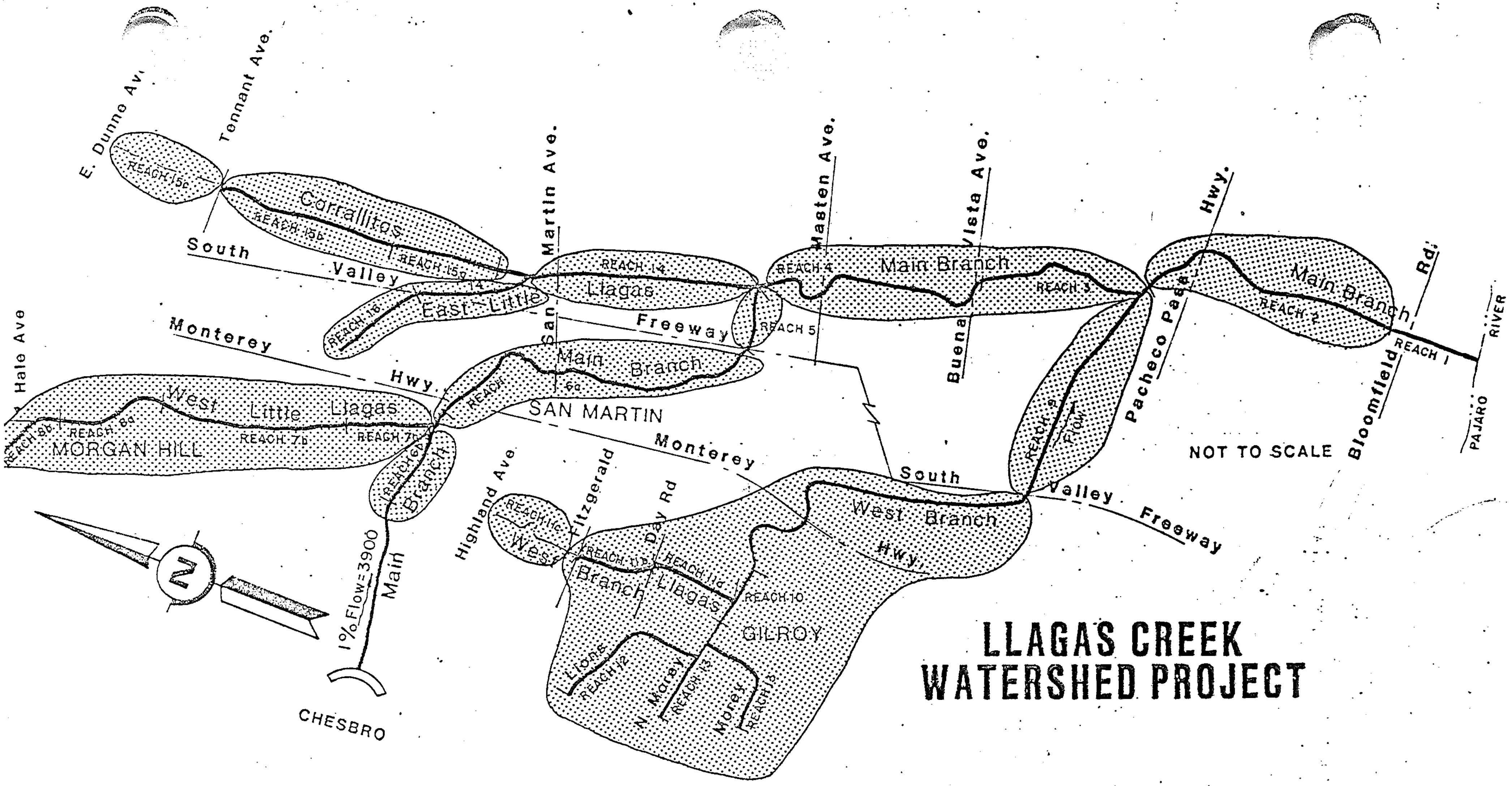
▨ Stabilize and revegetate only (fee) (previously constructed by Caltrans).

EXISTING



LLAGAS CREEK WATERSHED PROJECT

ALTERNATIVE A

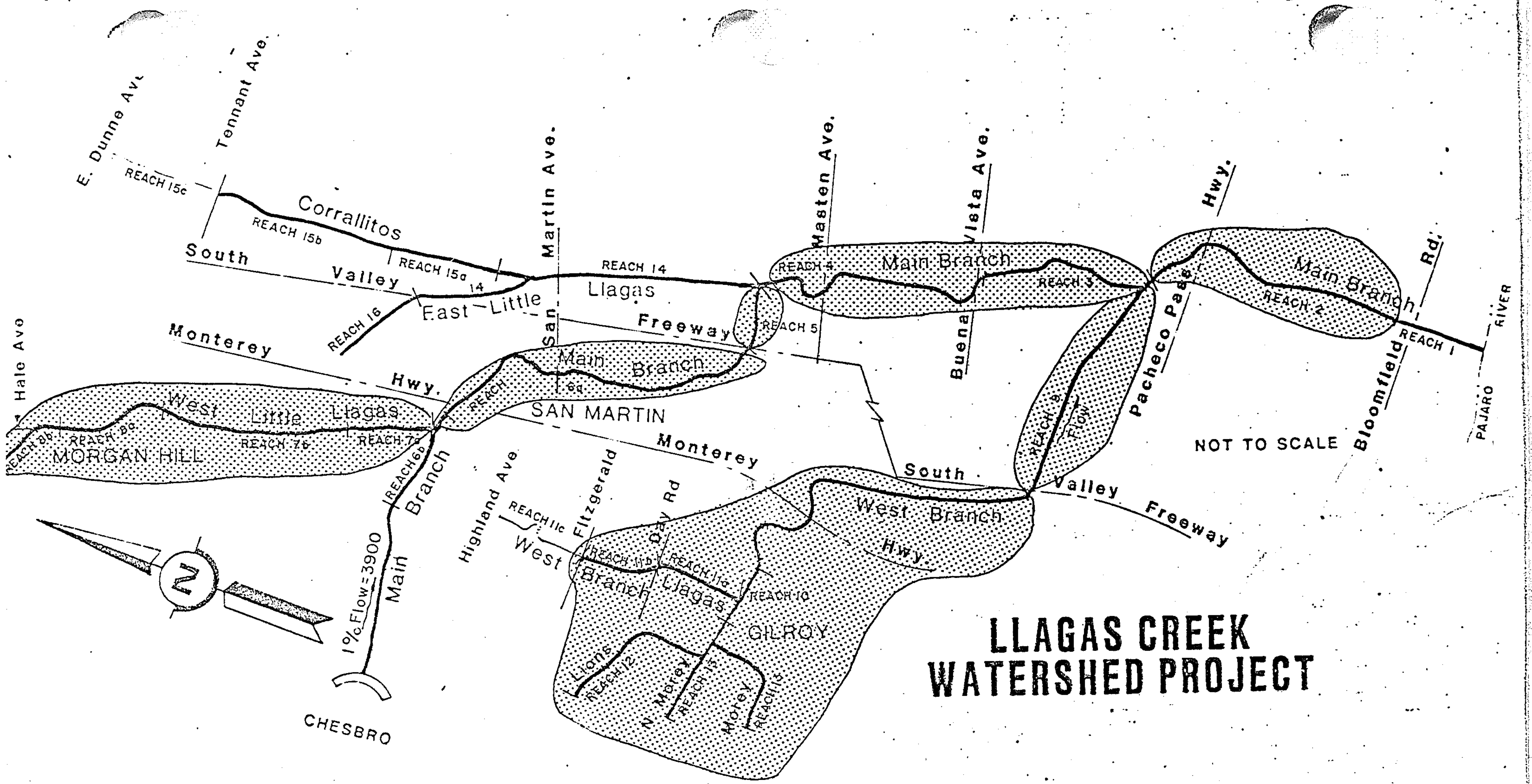


LLAGAS CREEK WATERSHED PROJECT

▨ 1% Channel (fee)

ALTERNATIVE B

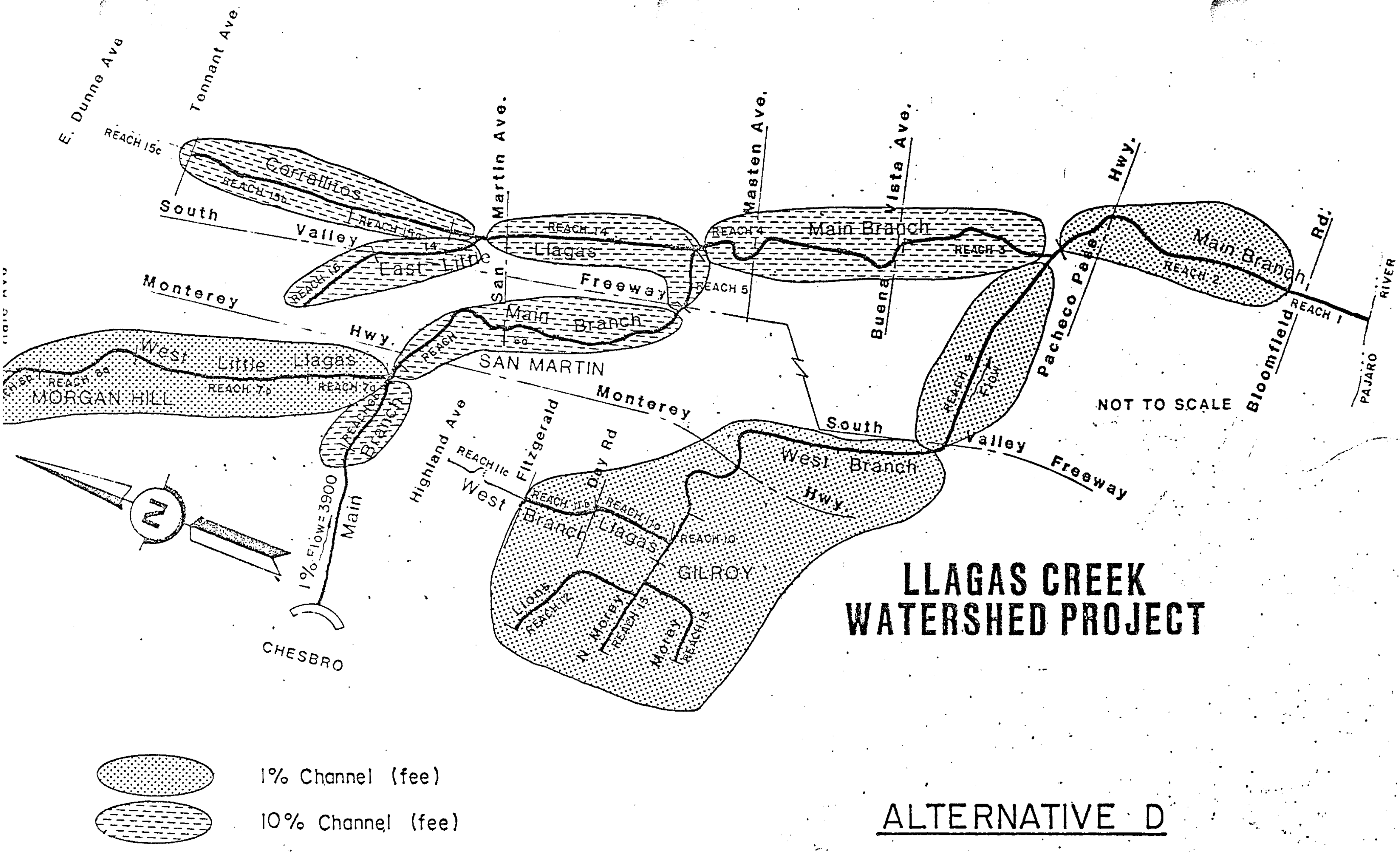
33
30



LLAGAS CREEK WATERSHED PROJECT

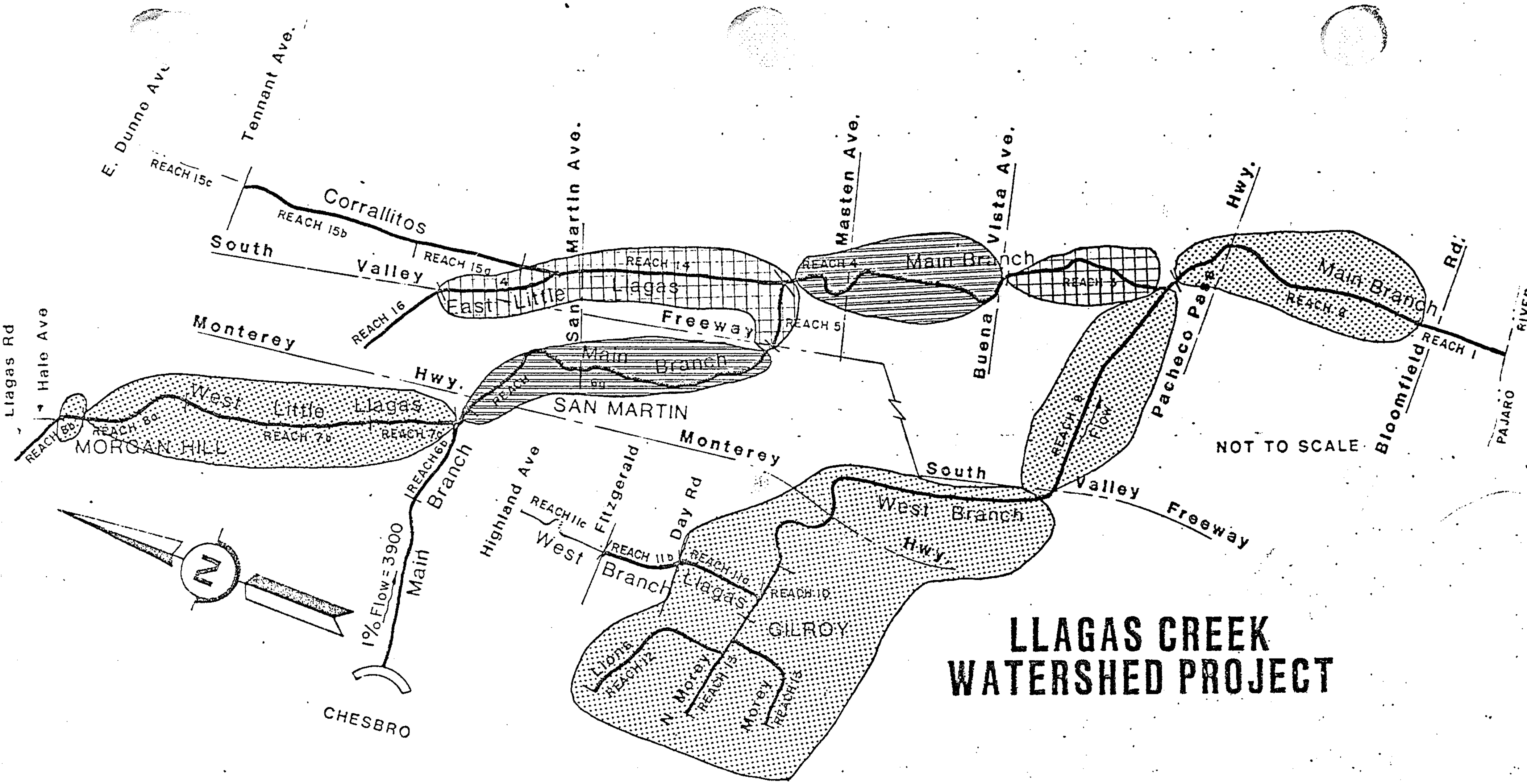
▨ 1% Channel (fee)

ALTERNATIVE C



LLAGAS CREEK WATERSHED PROJECT

ALTERNATIVE D



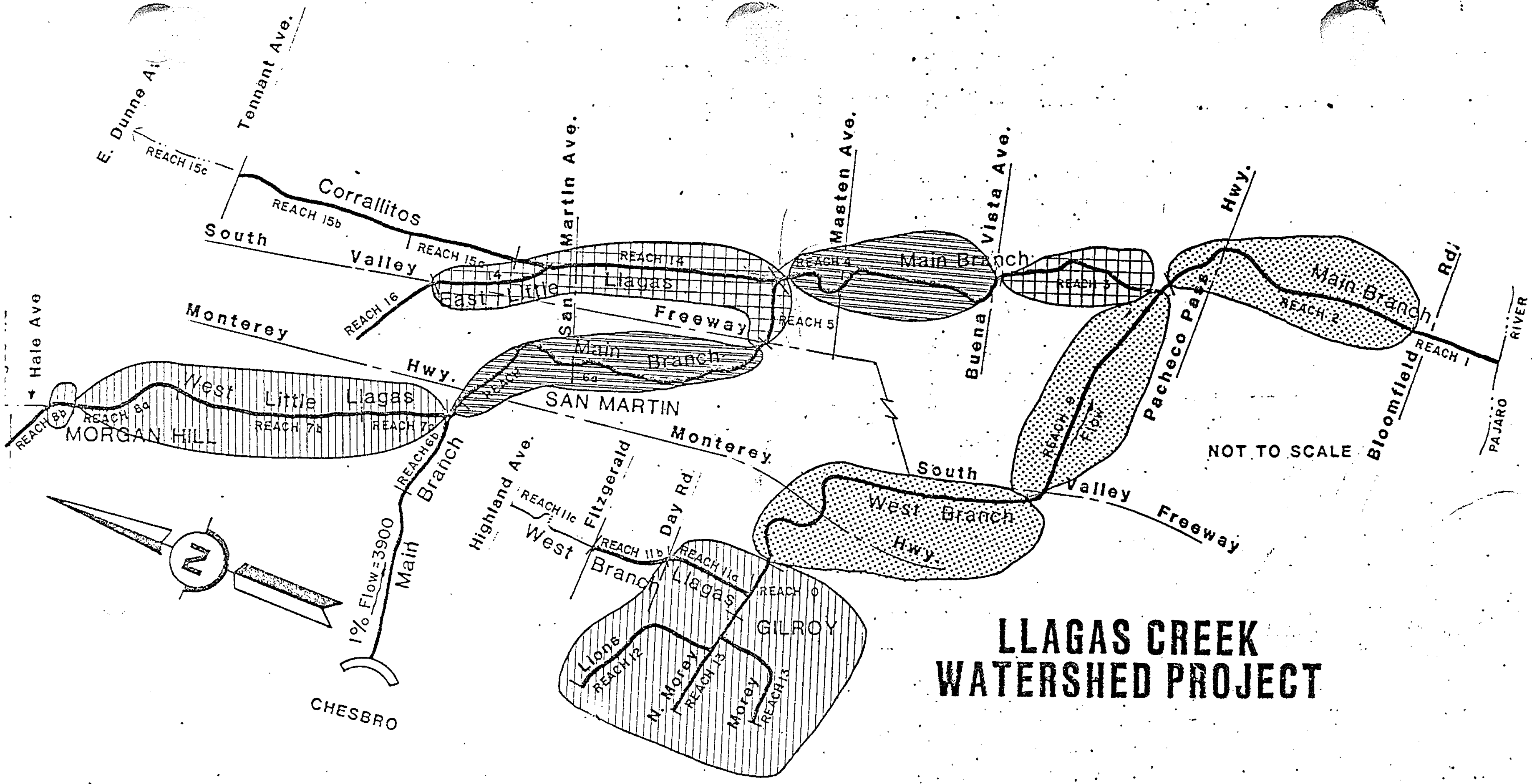
LLAGAS CREEK WATERSHED PROJECT

▨ 1% Channel (fee)

▤ No induced flooding only (easement).

▦ Stabilize and vegetate only (previously constructed by Caltrans) (fee)

ALTERNATIVE E



LLAGAS CREEK WATERSHED PROJECT

- ░ 1% Channel (fee)
- ▥ 1% Channel with reduced right of way (fee)
- ▦ Stabilize and vegetate only (previously constructed by Caltrans) (fee)
- ▤ No induced flooding only (easement)

ALTERNATIVE F

(1)

10/7/8
JM 12/5/8
35
38

LOCATION	STATION	PROPOSED 1% DESIGN FLOW (B)	10% DESIGN FLOW	1979 WORK-PLAN DESIGN FLOW (B)	FIS 1% FLO (A)
		(cfs)	(cfs)	(cfs)	(cfs)
MAIN BRANCH	Chesbro Outflow	2900		2900	3900
U/S W. LITTLE LLAGAS	743+00 - 714+00	3460	2370	3430	4800
U/S SAN MARTIN AVE.	714+00 - 625+00	5900	3800	5100	
U/S STA 582+00	625+00 - 582+00	6200	4100	5100	
U/S E. LITTLE LLAGAS	530+00 582+00 - 498+15	6200	4100	5400	5400
U/S RUCKER CR	498+15 - 386+00 △	12,350	7600	8900	10200
/S PANTHER CR	▷ 386+00 - 344+00	13,200	7900	9300	9400
LIVE OAK CR	344+00 - 314+00	13,450	7950	9300	9800
U/S LEAVESLY AVE	314+00 - 290+00	13,800	8100	9300	9800
U/S W. BRANCH LLAGAS	290+00 - 190+80	13,800	8100	10,100	5200
U/S PRINCEVALE	190+80 - 127+40	17,800	10400	16,300	
U/S STA 93+40	127+40 - 93+40	18,300	10700	17,100	11,000
U/S BLOOMFIELD RD	93+40 - 64+00	18,800	11000	13,900	14,800

(1) A LARGE SPILL AT LEAVESLY AVE. IS RESPONSIBLE FOR THIS REDUCTION OF FLOW IN THE MAIN CHANNEL. THE WATER WHICH LEAVES THE MAIN CHANNEL AT THIS POINT FLOWS DOWN LEAVESLY TO THE WEST AND THEN ALONG WITH LOCAL FLOWS TO THE SOUTH. PICKING UP ADDITIONAL NEAR THE RONAN CHANNEL THE WATER CONTINUES ACROSS HWY 152 AND ALONG THE MILLER SLOUGH. TOGETHER WITH THE WATERS FROM PRINCEVALE DRAIN THE FLOW REENTERS THE MAIN BRANCH NEAR THE

10/7/80
JM 12/8/80
~~36~~
39

LOCATION	STATION	PROPOSED 1% DESIGN FLOW (B)	10% DESIGN FLOW	1979 WORK-PLAN DESIGN FLOW (B)	FIS 1% FLOOD (A)	
		(cfs)	(cfs)	(cfs)	(cfs)	
WEST BRANCH LLAGAS						
U/S FITZGERALD RD	- 297+00	2070	1080			
U/S LIONS CR	297+00 - 182+00	2340	1280	2900	1500	
U/S LEAVESLY RD	182+00 - 118+00	4800	2700	4200	N/A	C
U/S MILLER SLOUGH	118+00 - 55+00	4800	2700	4200	N/A	C
U/S MAIN BR	55+00 - 0+00	6160	3500	5200	3500	C
LI[illegible]S CREEK						
U/S MOREY AVE	285+00 - 245+00	850	450	800		
U/S MOREY CR.	245+00 - 217+00	950	500	900	940	D
U/S W. BRANCH	211+00 - 182+00	1840	1050	2000	N/A	
N. MOREY CREEK						
U/S LIONS CR	233+00 - 217+00	485	300	280	340	D
S. MOREY CREEK						
U/S STA 230+00	245+00 - 230+00	200	120	200 ~~450~~		
LIONS CR.	230+00 - 211+00	420	260	450 200	480	D

* . DIFF SMALL.

*

(3)

JM . 10/3/80
10/7/80 .
JM 12/2/80
~~37~~
40

LOCATION	STATION	PROPOSED 1% DESIGN FLOW (B) (cfs)	10% DESIGN FLOW (cfs)	1979 WORK-PLAN DESIGN FLOW (B) (cfs)	FIS 1% FLO (A) (cfs)
WEST LITTLE LLAGAS					
	227+35 - 204+00	640	400	510	400
U/S WRIGHT AVE.	204+00 - 195+15	810	520	510	350
U/S MAIN ST	195+15 - 173+94	810	520	810	600
U/S 5TH ST.	173+94 - 149+00	950	610	1300	600
U/S SPRING ST	149+00 - 138+00	1050	690	1300	500
	138+00 - 130+00	1550	1000	1300	1040
/S EDMUNDSON AVE	130+00 - 96+40	1550	1000	1470	1040
	96+40 - 86+40	1670	1075	1680	1040
U/S EDMUNDSON CR	86+40 - 75+50	1670	1075	1680	1040
U/S MAIN BR	75+50 - 11+00	2200	1400	2160	1380 *
EAST LITTLE LLAGAS					
U/S MADRONE CH	220+85 - 180+50	1480	800	660	1300
U/S CORRALITOS CR.	180+50 - 121+50	2670	1450	1960	3580 **
U/S SAN MARTIN CR	121+50 - 52+00	5,270	2930	2940	4473 **
U/S CHURCH CR	52+00 - 6+00	6,330	3580	3630	5170 **
/S MAIN BR.	6+00 - 0+00	6,780	3830	4160	6,140 **

FLOW D/S OF EDMUNDSON CK., DOES NOT REFLECT PROPOSED DIVERSION

**) NOT IN DETAILED STUDY AREA

(4)

10/7/80
JM 12/8/80
~~38~~
41

LOCATION	STATION	PROPOSED 1% DESIGN FLOW (cfs)	10% DESIGN FLOW (cfs)	1979 WORK-PLAN DESIGN FLOW (cfs)	FIS 1% FLOOD (A) (cfs)
TENNANT CREEK					
U/S FOOTHILL CR.	126+70 - 106+00	1040	600	660	420 *
U/S CORRALLITOS CR	106+00 - 77+50	1430	830	660	610 *
CORRALLITOS CR					
U/S MIDDLE AVE.	77+50 - 45+20	2,360	1330	1440	1080 *
E. LITTLE	45+20 - 0+00	2,580	1470	1440	1080 *

*) NOT IN DETAILED STUDY AREA

LLAGAS CREEK - SELECTED DROP STRUCTURES

[illegible]	W	B	LS	LB	D		CONCRETE (CU. YD)
17,000	70	70	15	100	6		1350.7
9,000	50	50	12	75	5		824.1
5,000	38	38	9	57	3		488.0
3,000	32	32	7	48	3		270.1
2,000	25	25	6	38	2		237.0
1,000	16	16	5.5	24	5		174.3

DROP STRUCTURES

Q	FRONT WALLS	SIDE WALLS	EXIT WALLS	BOTTOM SLAB	CONCRETE TOTAL CU. YD.
17,000	235.9	279.2	29.4	806.2	1350.7
9,000	172.8	172.7	24.1	454.5	824.1
5,000	105.9	99.6	18.8	263.7	488.0
3,000	71.9	72.9	15.5	181.2	270.1
2,000	57.0	47.7	13.6	118.7	237.0
1,000	61.9	41.8	12.7	57.9	174.3

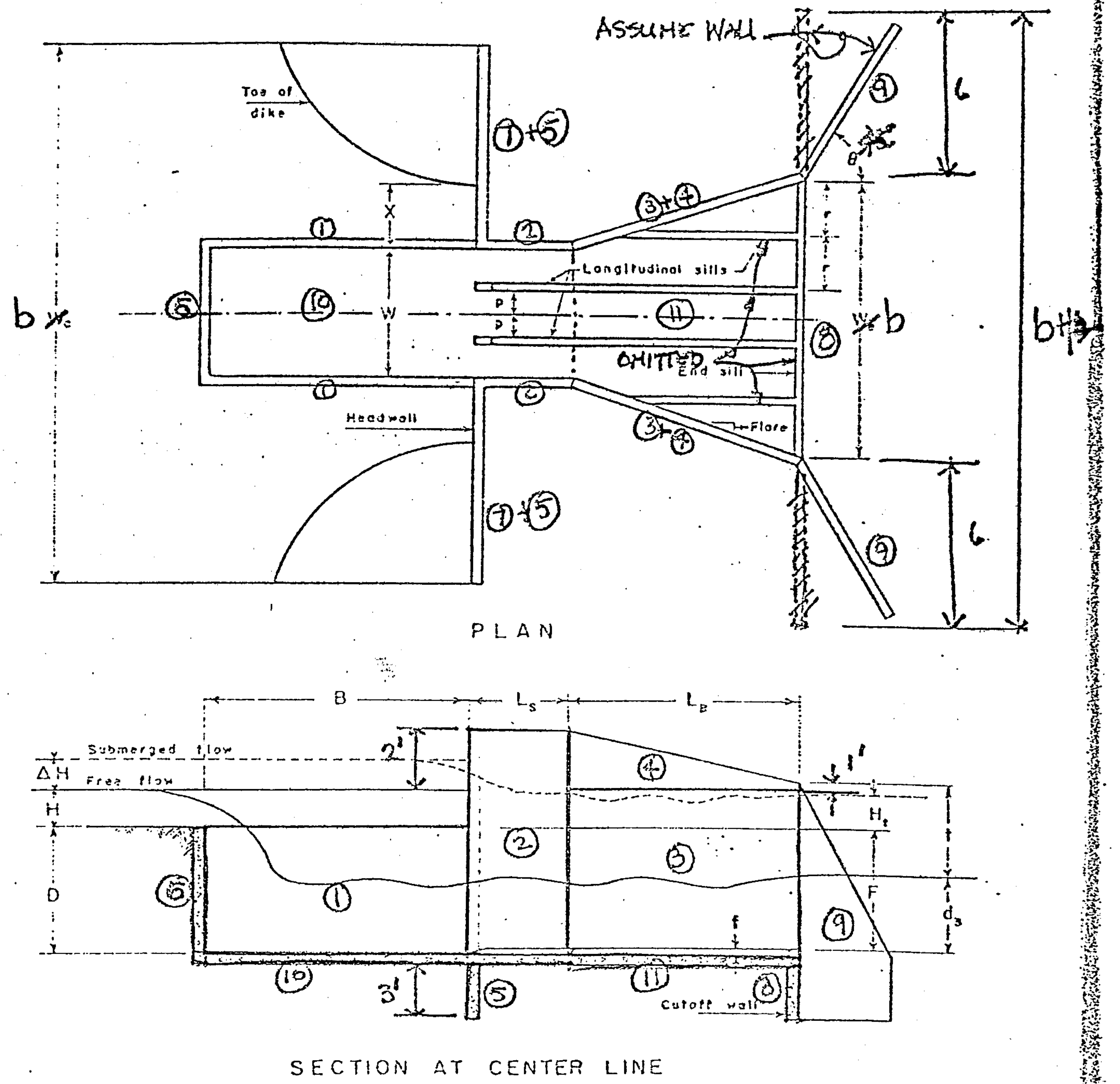


FIGURE 1.—Box-inlet drop spillway.

FREE-FLOW CAPACITY

Free flow exists in the box-inlet drop spillway whenever the downstream or tailwater level is so low that it has no effect on the amount of water that will pass the spillway. The problem then is to determine what parts of the spillway affect the flow and to evaluate these effects. Two different sections are effective in controlling the flow: the crest of the box inlet controls the flow up to that point where the box inlet is flooded out; the opening in the headwall controls at higher flows. The flow at which the control changes from one point to the other is dependent upon a number of factors, the principal ones being the box-inlet depth and its length.

Since the primary factors that influence the free flow past box-inlet drop spillways are dif-

LLAGAS CREEK

Q	⑤ $B \times W$	⑥ $D + 1.25' \times W + 2\overset{2.50}{(1.25)}$	⑦ ONE SIDE $b - W (4.25 + D + H + 2)$	FRONT WALL TOTAL - 2 SIDES ⑤ + ⑥ + 2 ⑦
,000	210	$\overset{7.25}{6} + 1.25 \times 72.5 = 52\overset{6}{5}.6$	$\overset{80}{150 - 70}(4.25 + 6 \overset{27.25}{+} 15 + 2) = 2180$	$\frac{5096 \times 1.25}{27} = 235.9$
,000	150	$\overset{6.25}{5} + 1.25 \times 52.5 = 328.1$	$\overset{70}{120 - 50}(4.25 + 5 \overset{23.25}{+} 12 + 2) = 1627.5$	$\frac{3733 \times 1.25}{27} = 172.8$
,000	114	$\overset{4.75}{3} + 1.25 \times 40.5 = 172.\cancel{X}$	$\overset{52}{90 - 38}(4.25 + 3 \overset{19.25}{+} 10 + 2) = 1001$	$\frac{2288 \times 1.25}{27} = 105.9$
,000	96	$\overset{4.25}{3} + 1.25 \times 34.5 = 14\overset{7}{6}.\cancel{6}$	$\overset{38}{70 - 32}(4.25 + 3 \overset{17.25}{+} 8 + 2) = 655.5$	$\frac{1544 \times 1.25}{27} = 71.9$
,000	75	$\overset{3.25}{2} + 1.25 \times 27.5 = 89.\cancel{4}$	$\overset{35}{60 - 25}(4.25 + 2 \overset{15.25}{+} 7 + 2) = 533.75$	$\frac{1231.5 \times 1.25}{27} = 57.0$
,000	48	$\overset{6.25}{5} + 1.25 \times 18.5 = 11\overset{6}{5}.6$	$\overset{34}{50 - 16}(4.25 + 5 \overset{17.25}{+} 6 + 2) = 586.5$	$\frac{1337 \times 1.25}{27} = 61.9$

DROP STRUCTURE FRONT WALLS

LLAGAS CREEK

Q	① $B \times D$	② $L_S(D+H+2)$	③ $L_B(D+H)$	④ $L_B \times 3/2$	TOTAL 2 SIDES $2(①+②+③+④)$ (CU YD)
7,000	70×6 = 420	$15(\overset{23}{6+15+2})=345$	$100(\overset{21}{\cancel{6}+15})=2100$	100 × 1.5 = 150	$\frac{6030\times1.25}{27}=279.2$
9,000	50×5 = 250	$12(\overset{19}{\cancel{5}+12+2})=228$	$75(\overset{17}{\cancel{5}+12})=1275$	75 × 1.5 = 112.5	$\frac{3731\times1.25}{27}=172.7$
5,000	38×3 = 114	$9(\overset{15}{\cancel{3}+10+2})=135$	$57(\overset{13}{\cancel{3}+10})=741$	57×1.5 = 85.5	$\frac{2151\times1.25}{27}=99.6$
3,000	32×3 = 96	$7(\overset{13}{3+8+2})=91$	$48(\overset{11}{3+8})=528$	48×1.5 = 72	$\frac{1574\times1.25}{27}=72.9$
2,000	25×2 = 50	$6(\overset{11}{\cancel{2+7+2}})=66$	$38(\overset{9}{\cancel{2+7}})=342$	38×1.5 = 57	$\frac{1030\times1.25}{27}=47.7$
1,000	16×5 = 80	$5.5(\overset{13}{\cancel{5+6+2}})=71.5$	$24(\overset{11}{5+6})=264$	24×1.5 = 36	$\frac{903\times1.25}{27}=41.8$

DROP STRUCTURE SIDE WALLS

LLAGAS CREEK

Q	⑧ 3×10	⑨ $4.25 \times 6 + \overset{3}{\frac{6}{2}}(D+H+1)$	TOTAL ⑧ + 2×⑨
17,000	450	$26.5 + 3(\overset{66}{6} + \overset{22}{15} + 1) = 92.5$	$\frac{635 \times 1.25}{27} = 29.4$
9,000	360	$26.5 + 3(\overset{54}{5} + \overset{18}{12} + 1) = 80.5$	$\frac{521 \times 1.25}{27} = 24.1$
5,000	270	$26.5 + 3(\overset{42}{3} + \overset{14}{10} + 1) = 68.5$	$\frac{407 \times 1.25}{27} = 18.8$
3,000	210	$26.5 + 3(\overset{36}{3} + \overset{12}{8} + 1) = 62.5$	$\frac{335 \times 1.25}{27} = 15.5$
2,000	180	$26.5 + 3(\overset{30}{2} + \overset{10}{7} + 1) = 56.5$	$\frac{293 \times 1.25}{27} = 13.6$
1,000	150	$26.5 + 3(\overset{36}{5} + \overset{12}{6} + 1) = 62.5$	$\frac{275 \times 1.25}{27} = 12.7$

DROP STRUCTURE EXIT WALLS

LLAGAS CREEK

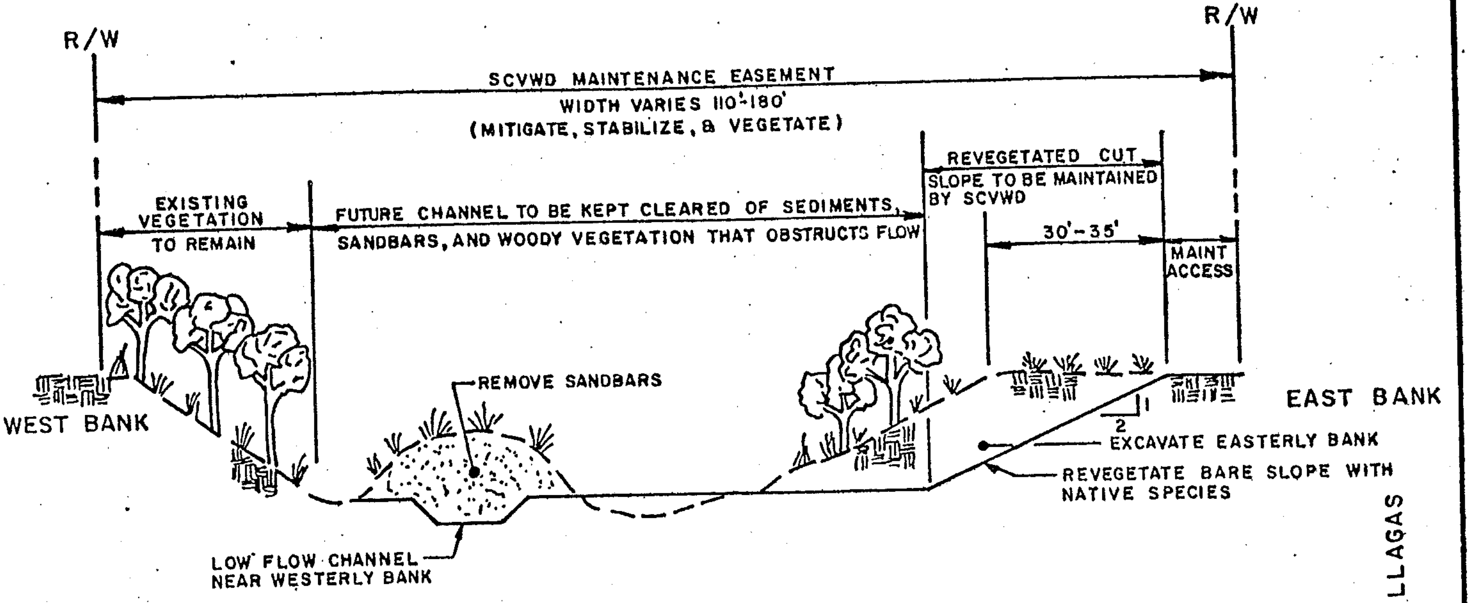
Q	⑩ $W+2(1.25)\,(B+Ls)$	⑪ $LB\left[\dfrac{W+\overset{2.50}{2(1.25)}+b+\overset{2.50}{2(1.25)}}{2}\right)$	TOTAL 10 + 11
7,000	$\overset{72.5}{70+2.50}\,(\overset{85}{70+15}) = 616\overset{2}{\cancel{2.5}}$	$\overset{50}{100}\left[\dfrac{\overset{225}{72.5+152.5}}{2}\right) = 11,250$	$\dfrac{17413\times1.25}{27} = 806.2$
9,000	$\overset{52.5}{\cancel{50+2.50}}\,(\overset{62}{50+12}) = 3255.0$	$75\left(\dfrac{\overset{175}{52.5+122.5}}{2}\right) = 6,56\overset{3}{\cancel{2.5}}$	$\dfrac{9818\times1.25}{27} = 454.5$
5,000	$\overset{41.5}{38+2.50}\,(\overset{47}{38+9}) = 190\overset{4}{3.5}$	$57\left(\dfrac{\overset{133}{40.5+92.5}}{2}\right) = 3,79\overset{1}{\cancel{0.5}}$	$\dfrac{5695\times1.25}{27} = 263.7$
3,000	$\overset{34.5}{32+2.50}\,(\overset{39}{32+7}) = 134\overset{6}{\cancel{5.5}}$	$48\left(\dfrac{\overset{107}{34.5+72.5}}{2}\right) = 2,568$	$\dfrac{3914\times1.25}{27} = 181.2$
2,000	$\overset{27.5}{25+2.50}\,(\overset{31}{25+6}) = 85\overset{3}{\cancel{2.5}}$	$38\left(\dfrac{\overset{90}{27.5+62.5}}{2}\right) = 1,710$	$\dfrac{2563\times1.25}{27} = 118.7$
1,000	$\overset{18.5}{16+2.50}\,(\overset{21.5}{16+5.5}) = 39\overset{8}{\cancel{7.75}}$	$24\left(\dfrac{\overset{71}{18.5+52.5}}{2}\right) = 852$	$\dfrac{1250\times1.25}{27} = 57.9$

DROP STRUCTURE BOTTOM SLAB

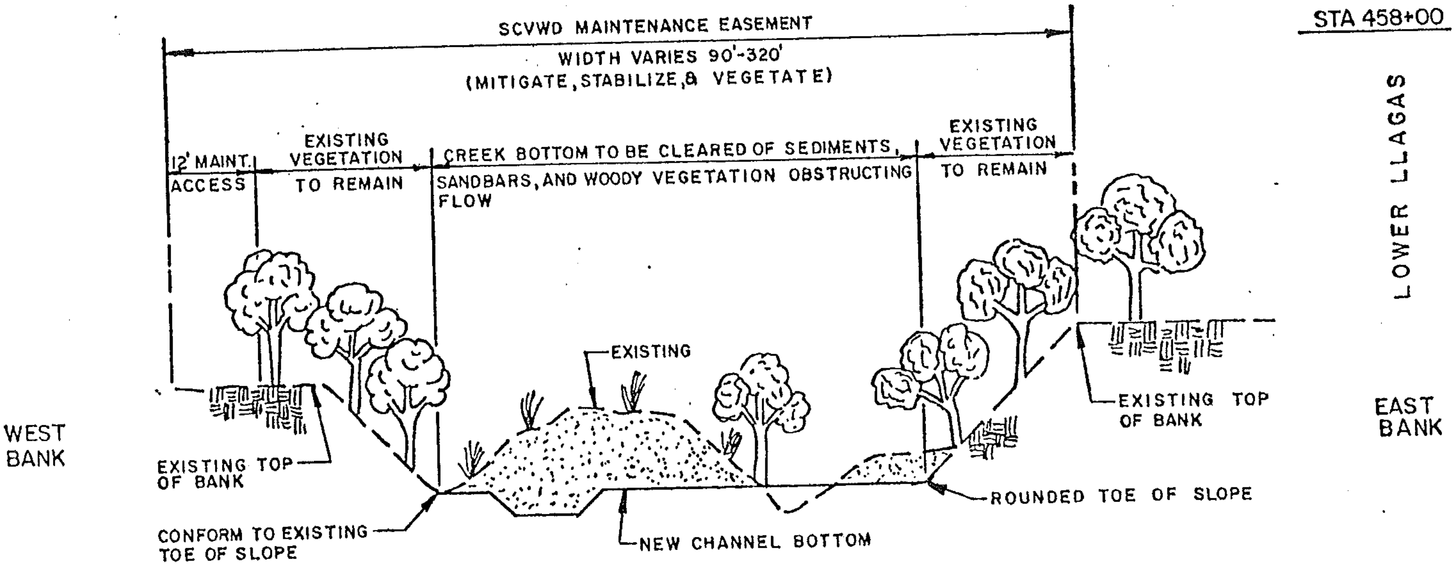
Reach 4U

This reach extends from station 458+00 to 498+15 on Llagas Creek. The construction in this reach will be to remove sand and gravel bars, enlarge restricted areas and riprap some outside curves. The work will be one sided construction from the right side looking upstream. The capacity will be such that no induced flooding from work upstream. A low flow channel to provide for fish migration will be incorporated.

MAIN BRANCH LLAGAS CREEK


R/W
R/W
SCVWD MAINTENANCE EASEMENT
WIDTH VARIES 110'-180'
(MITIGATE, STABILIZE, & VEGETATE)
REVEGETATED CUT SLOPE TO BE MAINTAINED BY SCVWD
EXISTING VEGETATION TO REMAIN
FUTURE CHANNEL TO BE KEPT CLEARED OF SEDIMENTS, SANDBARS, AND WOODY VEGETATION THAT OBSTRUCTS FLOW
30'-35'
MAINT ACCESS
REMOVE SANDBARS
WEST BANK
EAST BANK
1
2
EXCAVATE EASTERLY BANK
REVEGETATE BARE SLOPE WITH NATIVE SPECIES
LOW FLOW CHANNEL NEAR WESTERLY BANK
UPPER LLAGAS

STA 458+00(1000' d/s Masten) To STA 498+15(confluence w/ East Little Llagas)


STA 458+00
LOWER LLAGAS
SCVWD MAINTENANCE EASEMENT
WIDTH VARIES 90'-320'
(MITIGATE, STABILIZE, & VEGETATE)
12' MAINT. ACCESS
EXISTING VEGETATION TO REMAIN
CREEK BOTTOM TO BE CLEARED OF SEDIMENTS, SANDBARS, AND WOODY VEGETATION OBSTRUCTING FLOW
EXISTING VEGETATION TO REMAIN
EXISTING
WEST BANK
EXISTING TOP OF BANK
CONFORM TO EXISTING TOE OF SLOPE
NEW CHANNEL BOTTOM
ROUNDED TOE OF SLOPE
EXISTING TOP OF BANK
EAST BANK

STA 379+00(Buena Vista Ave) To STA 458+00(1000' d/s Masten)

BUENA VISTA AVE. TO CONFLUENCE WITH EAST LITTLE LLAGAS CREEK

REACH 4

FIGURE 4

Calif

LL Hansen 7/24/81

Reach 4U

Upper Llagas Creek

Cost Summary

Excavation	11000+3600=14600 ~~10000 cy~~	$2.80/cy	~~30800~~ ~~50,400~~	40880
Embankment	350 cy	2.80/cy	980	
Riprap /	1000 sy	@ $70/sy	70,000	
Seeding	2.4 ac	@ $1200/ac	2880	
Subtotal			~~124,260~~ ~~103,860~~	114740
Mobilization 3%			~~3116~~ ~~3728~~	3442
Subtotal			~~127,988~~ ~~106,976~~	118182
Contengency 12%			~~15,359~~ ~~12,837~~	14182
Total 566			~~143,347~~ ~~119,813~~	132364
R/W				
Total Other	1ac	@ 6,000	6000	6000
Reach Total			$149,347 ~~$125,813~~	138364

Calif

L L Hansen 7/24/81

Reach 4U

Upper Llagas Creek

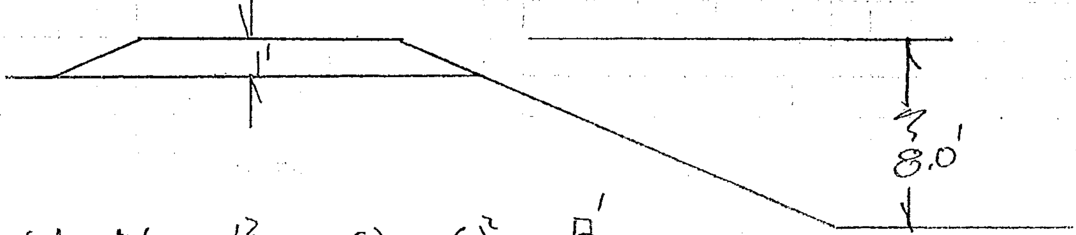
Hydraulics -

Same as in 4L

Depth of channel adequate without embankments except at Sta 476+00

To get 8' depth add 1' embankment on left side looking downstream

begin embankment at 473+75 and end at 480+25



$Vol = bd + zd^2 = 12(1) + 2(1)^2 = 14^{\square'}$

$Vol = \frac{14(48025-47375)}{27} = 337$ use $\underline{\underline{350\ cy}}$

Calif
LL Hansen
Reach 4 U

Upper Llagas Creek

Sta 458+00 – 498+15
Scale V=H 1"=10' 1□"=100□' b=50'

Sta	A□" (plan)	Avg A□'	L	Vol (CY)
458+00	1.27			
		127	450	2117
462+50	1.27			
		66	440	1076
466+90	.05			
		20	80	59
467+70	.35			
		45	380	633
471+50	.54			
		217	450	3617
476+00	1.63			
		154	850	4848
484+50	1.45			
		117	750	3250
492+00	.89			
		89	615	2027
498+15	.89			
			4015	17627

Calif

Upper Llagas

ALHansen 7/28/81

Reach 4U

Hydraulics
Aged = As Built

```
     WP PROG    17
        DATA
         4000.          Q1
           45.           B
            2.           Z
       0.0025            S
        0.035            N

       OUTPUT
           8.7           D
          79.8           T
        542.88           A
    6.46997544           R
   4001.532665          Q2
   7.370934028           V
    Q1/Q2 RATIO
  .9996169805
         END
```

For Stability see 1966 Soil Test OK at

Sta 462+00 – 535+00   22ft

TABLE 10

UPPER AND LOWER LLAGAS CREEK WATERSHED PROJECTS

CHANNEL DESIGN CHECK – NEW SOILS DATA

LLAGAS CREEK – NON-COHESIVE SOILS

														Allowable Velocities from TR-25, fig. 6-1		
Test Hole Number	Station	D_{75} (inches)	d (feet)	b (feet)	s (ft/ft.)	n_t	s_t	T_∞ (lb/sq.ft)	T_∞/T_b	T_b	$T_b/0.4$	Armor diameter D? (inches)	Scour Depth (inches)	Tabular Value (ft/sec.)	D	$\overline{V}$ ft/sec.
L7Q-1	410+00	0.60	12	99	0.0010	0.0235	0.00045	0.34	0.99	0.34	0.85	D_{84}	5.3	6.6	1.25	8.3
LGP-1	430+00	0.50	11	122	0.0009	0.0228	0.00038	0.26	1.0	0.26	0.65	D_{84}	4.1	6.1	1.25	7.6
A12P-1	462+00	2.56	8	111	0.0031	0.030	0.0023	1.15	1.0	1.15	2.87	D_{76}	12.0	9.7	1.2	11.6
L5P-1	535+00	1.33	7	85	0.0026	0.0279	0.00165	0.72	1.0	0.72	1.80	D_{82}	10.0	8.4	1.18	9.9
L4P-1	570+00	0.70	7	85	0.0026	0.0242	0.00124	0.54	1.0	0.54	1.35	D_{90}	13.5	7.5	1.18	8.9
L3P-1	637+00	0.75	7	1/	0.0030	0.0245	0.00147	0.64	1.0	0.64	1.60	D_{85}	10.6	8.1	1.18	9.5
L2P-1	672+00	0.375	7	78	0.0030	0.022	0.0012	0.51	1.0	0.51	1.27	D_{88}	10.5	7.4	1.18	8.7
L1P-1	700+00	6.00	7	65	0.0042	0.0346	0.0041	1.79	0.99	1.77	4.44	D_{68}	13.9	11.0	1.18	13.0
L1Q-1	725+00	1.75	7	42	0.0045	0.0281	0.0029	1.26	0.98	1.24	3.10	D_{77}	13.5	9.9	1.18	11.7

1/ Unimproved reach, no specific base width

February 1966

Calif Upper Llagas

LL Hansen 7/28/81
Reach 4U

B=45' From SCVWD X sections
scale 1"=10' 1□"=100□'

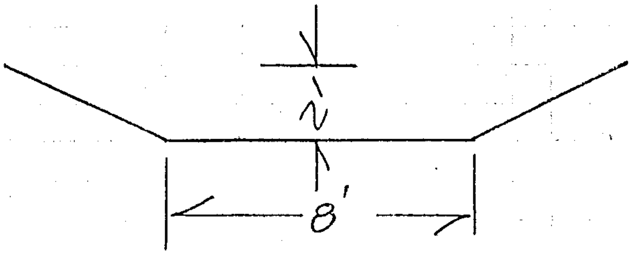
Sta	$A^{\square''}$ planimeter	$A^{\square''}$ reduced	$A^{\square''}$	Ave $A^{\square'}$	L	Vol (cu yd)
458+00	1.27	.44	.83			
				83	450	1383
462+50	1.27	.44	.83			
				46	440	750
466+90	~~.05~~	–	.09			
				11	80	32
467+70	.35	–	.13			
				19	380	267
471+50	.54	–	.25			
				83	450	1383
476+00	1.63	.24	1.39			
				116	850	3651
484+50	1.45	.52	.93			
				78	750	2166
492+00	.89	.26	.63			
				63	615	1435
498+15	.89	.26	.63			
					4015	11067

Calif
LLHansen 7/31/81
Reach 4U

Upper Llagas

Low Flow Channel

This is installed for mitigation of fisheries



$$Vol/ft = \frac{8(2)+2(2)^2}{27} = 0.89\ cy/ft$$

$$L = 49815 - 45800 = 4015'$$

$$Vol = 0.89(4015) = 3573 \quad use\ \underline{\underline{3600}}\ cy$$

Calif
KL Hansen 7/24/81
Reach 4 U

Upper Llagas Creek

Erosion Seeding

Seed disturbed areas
Consider these to be cut bank slopes and maintenance road

Maint. Rd = 12' = W

$L = 49815 - 45800 = 4015'$

$A_{road} = 12(4015) = 48180 \square'$

Side slope on embankment

$A_{emb} = 2(1)(2.24)(650) = 2912 \square'$

Cut slopes

Sta	W	Ave W	L	A
458+00	20			
		20	450	9000
462+50	20			
		12	440	528
466+90	3			
		4	80	320
467+70	5			
		8	380	3040
471+50	10			
		10	450	4500
476+00	10			
		16	850	13600
484+50	21			
		18	750	13500
492+00	14			
		14	615	8610
498+15	14			
				53098

Σ Area = 48180 + 2912 + 53098 = $\frac{104190}{43560}$ = 2.39 ac

4/6/
Ty
60

LLAGAS CREEK — REACH 4 Between Masten Ave
& Confluence of E & W LLAGAS Crk

Excavation
30,000 × $2.80/C.Y = $84,000

Clearing 1 Ac. × $1,150/Ac = $1,150

$\frac{60 \times 3040}{43560} = .07$ Ac
use 1 Ac

800 l.f of Sack riprap

$\frac{15' \times 600'}{9}$ × $70/S.Y = $70,000

$155,150
3% Mitigation Measures 4655
159,805
Mobilization 4794
164599
12% Contig 19752
184351 use $185,000

Additional R/W Costs (Easement)

1 Ac. × $6000/Ac = $6,000

COMPUTED BY: TJ 11/6/81

Station	Distance	CUT				FILL		
		End Area	Average	Cubic Yards		End Area	Average	Cubic Yards
469+05		0						
	335			2376				
472+40		383						
	340			4420				
475+80		319						
	310			3100				
478+90		221						
	283			1158				
481+73		0						
492+80		0						
	385			1925				
496+65		270						
	315			3757				
499+80		374						
	410			5163				
503+90		306						
	335			4696				
507+25		451						
	330			2756				
510+55		0						
				29,351				
				use 30,000 C.Y.				

```
HEC2 RELEASE DATED NOV 76 UPDATED JULY1979
ERROR CORR -  01,02,03
MODIFICATION -  50,51,52
*****************************************************

NOTE- ASTERISK (*) AT LEFT OF CROSS-SECTION NUMBER INDICATES MESSAGE IN SUMMARY OF ERRORS LIST
```

REACH4 Between Rucker Ave
and E&W Branch.

Final

```
REACH FOUR

SUMMARY PRINTOUT
```

From George Nolte (@4900)

```
        CWSEL     CRIWS      EG      DEPTH     XLBEL     RBEL       VCH     QLOB      QCH      QROB

      236.670    233.95    237.20     8.97    235.90    235.90     6.15   137.76   3604.07   258.17
      237.194    232.43    237.52     9.49    234.60    234.70? fill 4.56  0.00   4000.00     0.00 EXC
      237.021    233.39    237.56     8.62    237.90 Exc 238.40 ✓   5.89     0.00   4000.00     0.00 EXC
      236.926    234.08    237.58     7.99    237.10    238.30 ✓   6.50     0.00   4000.00     0.00 EXC
      237.296    234.71    237.97     8.10    238.70    238.20 ✓   6.61     0.00   4000.00     0.00
      237.309      0.00    237.99     8.11    239.40    239.20     6.63     0.00   4000.00     0.00
      237.667    237.04    239.00     6.87    241.60    239.70     9.28     0.00   4000.00     0.00
      239.698    238.14    240.70     7.80    243.10    242.40     8.03     0.00   4000.00     0.00
      241.086    238.02    241.60     8.99    242.10    239.60? fill 5.76  0.00   4000.00     0.00
      240.853    238.92    241.66     6.35    244.00    242.30     7.21     0.00   4000.00     0.00 EXC
      240.999    238.59    241.67     6.60    244.80    243.50     6.59     0.00   4000.00     0.00 EXC
 *    240.523    240.52    242.38     4.02    244.20    246.00    10.94     0.00   4000.00     0.00 EXC
      241.943    239.24    242.51     7.14    241.20    246.00     6.04     0.00   4000.00     0.00 EXC
 *    242.712    242.71    245.18     7.71    244.50    246.50    12.61     0.00   4000.00     0.00
      245.539    242.98    246.16     9.24    246.10    246.90     6.32     0.00   4000.00     0.00


  SUMMARY OF ERRORS
```

29

```
                                                                                THIS RUN EXECUTED  2/26/81   .57

 ***********************************************
   HEC2 RELEASE DATED NOV 76 UPDATED JULY1979
   ERROR CORR -  01,02,03
   MODIFICATION -  50,51,52
 ***********************************************
```

REACH 4
1% WATER SURFACE AND 600 C.F.S.
INCREMENT FOR NO INDUCED FLOODING

```
 NOTE- ASTERISK (*) AT LEFT OF CROSS-SECTION NUMBER INDICATES MESSAGE IN SUMMARY OF ERRORS LIST


 REACH FOUR

 SUMMARY PRINTOUT


       SECNO        Q        QCH       QLOB       QROB      CWSEL     TOPWID      VCH     DEPTH      SSTA     STENCL     ENCST

    37715,000   9000,00   9000,00       0,00       0,00    216,40     141,82      7,26    11,00    9948,18   9852,00   10089,99  1
    37715,000   9600,00   9600,00       0,00       0,00    216,40     141,82      7,74    11,00    9948,18   9852,00   10089,99  1

    38070,000   9000,00   9000,00       0,00       0,00    216,70     127,50      8,48     9,30    9952,00   9952,00   10079,50  1
    38070,000   9600,00   9600,00       0,00       0,00    216,75     127,60      8,99     9,35    9952,00   9952,00   10079,69  1

    38443,000   9000,00   9000,00       0,00       0,00    217,03     120,34     11,29    12,13    9926,08   7810,00   10046,42  1
    38443,000   9600,00   9600,00       0,00       0,00    217,14     120,90     11,86    12,24    9925,77   7810,00   10046,67  1

 *  38785,000   9000,00   9000,00       0,00       0,00    218,32     123,58     13,60     8,92    9922,08   7881,00   10045,66  1
    38785,000   9600,00   9600,00       0,00       0,00    218,62     126,66     13,73     9,22    9919,78   7881,00   10046,44  1

    38867,000   9000,00   9000,00       0,00       0,00    219,00     108,29     13,45    10,00    9949,60   9937,00   10057,90  1
    38867,000   9600,00   9600,00       0,00       0,00    219,15     109,38     14,01    10,15    9949,16   9937,00   10056,59  1

 *  38911,000   9000,00   8999,07       0,93       0,00    221,19     126,27     10,11    11,69    9948,00   9948,00   10074,27  1
 *  38911,000   9600,00   9598,35       1,65       0,00    221,56     128,36     10,23    12,06    9948,00   9948,00   10070,56  1

    39090,000   9000,00   8307,06       0,00     692,94    222,54     509,89      7,24    11,54    9873,62   7770,00   10383,51  1
    39090,000   9600,00   8274,50      57,16    1268,34    223,06     830,18      6,63    12,06    9635,61   7770,00   10465,79  1

 *  39255,000   9000,00   7971,35     311,87     716,78    222,90     668,29      9,14    12,60    9767,87   7640,00   10450,16  1
 *  39255,000   9600,00   8257,76     392,88     949,36    223,03     702,99      9,28    12,73    9753,35   7640,00   10456,34  1

    39660,000   9000,00   2925,56    5689,50     384,95    224,38    1045,90      4,47    12,18    9300,80   7164,00   10346,70  1
    39660,000   9600,00   3026,39    6099,95     473,66    224,52    1089,00      4,54    12,32    9286,55   7164,00   10375,56  1

    39810,000   9000,00   4753,28    3707,84     538,88    224,30    1043,21      6,96    12,60    9247,26   8000,00   10290,47  1
    39810,000   9600,00   4767,16    4170,89     661,95    224,46    1097,90      6,83    12,76    9221,58   8000,00   10319,48  1
```

```
      39810.000    9000,00    4753,         3707,84      538,88      224,30     1043,2              6,96       12,60    9247,26    8000,00          0,47 10585
      39810.000    9600,00    476           4170,89      661,95      224,46     1097,               6,83       12,76    9221,58    8000,00          9,48 10585

      40180,000    9000,00    4009,22       4858,87      131,91      224,90     1221,06             5,84       11,50    8818,38    8000,00    10091,00 10091
      40180,000    9600,00    4061,96       5387,79      150,25      225,02     1246,59             5,81       11,62    8792,90    8000,00    10091,00 10091

      40585,000    9200,00    2697,81       6502,19        0,00      225,36     1530,64             4,31        9,66    8399,58    8000,00    10025,00 10025
      40585,000    9800,00    2755,40       7044,60        0,00      225,46     1531,51             4,34        9,76    8399,29    8000,00    10025,00 10025

      40965,000    9200,00    2883,97       6316,03        0,00      225,54     1507,16             5,24        9,64    8323,92    8000,00    10023,31 10024
      40965,000    9800,00    2922,37       6877,63        0,00      225,65     1527,73             5,22        9,75    8318,22    8000,00    10023,43 10024




        SECNO         Q          QCH        QLOB        QROB        CWSEL      TOPWID          VCH       DEPTH       SSTA      STENCL       ENDST     STE

      41440,000    9200,00    5125,48       3638,78      435,74      225,95     1652,42             7,16        9,55    8473,39    8000,00    10388,00 1038
      41440,000    9800,00    5155,63       4099,26      545,11      226,06     1673,01             7,07        9,66    8473,04    8000,00    10388,00 1038

      41845,000    9600,00    4399,21       5021,16      179,63      226,82     1523,68             6,50        9,82    8449,56    8000,00    10145,00 10145
      41845,000   10200,00    4561,14       5438,83      200,04      226,88     1528,94             6,68        9,88    8449,22    8000,00    10145,00 10145

      42265,000    9800,00    2903,67       6666,77      229,56      227,54     1914,30             5,61        9,44    8237,46    8000,00    10151,76 1016
      42265,000   10400,00    2931,02       7214,06      254,93      227,63     1930,96             5,58        9,53    8225,98    8000,00    10156,94 1016

      42687,000    9800,00    3109,86       6690,14        0,00      227,99     2077,61             5,46        8,99    7957,96    7000,00    10035,56 1003
      42687,000   10400,00    3166,91       7233,09        0,00      228,06     2088,76             5,49        9,06    7946,95    7000,00    10035,71 1003

      43090,000    9800,00    2388,98       7411,02        0,00      228,37     1985,25             5,06        9,47    8065,30    7000,00    10050,55 10053
      43090,000   10400,00    2436,62       7963,38        0,00      228,44     1994,56             5,11        9,54    8056,22    7000,00    10050,77 10053.

    * 43385,000    9800,00    4306,09       5493,91        0,00      228,96     1338,64             8,60        8,16    8166,34    7000,00    10045,10 10046.
    * 43385,000   10400,00    4416,27       5983,72        0,00      229,03     1372,05             8,73        8,23    8154,91    7000,00    10045,22 10046.

      43790,000    9800,00    3536,13       6099,42      164,45      230,32     1796,09             5,86        9,62    8351,23    7000,00    10250,00 10250.
      43790,000   10400,00    3607,39       6591,48      201,13      230,40     1821,72             5,91        9,70    8335,49    7000,00    10250,00 10250.

      44145,000    9800,00    4735,84       4972,00       92,15      230,85     1449,24             7,64        9,25    8666,78    7000,00    11000,00 11000.
      44145,000   10400,00    4836,58       5436,00      127,42      230,93     1513,48             7,71        9,33    8660,64    7000,00    11000,00 11000.

    * 44530,000    9800,00    5826,89       2520,46     1452,65      232,21     1357,86             8,24        9,61    9006,85    7000,00    10551,26 11000.
    * 44530,000   10400,00    5972,71       2798,96     1628,33      232,28     1390,55             8,36        9,68    8999,90    7000,00    10560,04 11000.

    * 44925,000    9800,00    5155,62       1199,17     3445,21      233,93     1731,32             8,30       10,03
```

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     [illegible]  10400,00  [illegible] [illegible]     0,00  [illegible] [illegible] [illegible]   9,00  [illegible]  7000,00 [illegible] [illegible]

     43090,000   9800,00   2388,98    411,02       0,00     228,37    1985,25   [illegible],06   9,47   8065,30   7000,00  1[illegible]5 10053,00
     43090,000  10400,00   2436,62    963,38       0,00     228,44    1994,56       5,11        9,54   8056,22   7000,00  10050,77 10053,00

   * 43385,000   9800,00   4306,09   5493,91       0,00     228,96    1338,64       8,60        8,16   8166,34   7000,00  10045,10 10046,00
   * 43385,000  10400,00   4416,27   5983,72       0,00     229,03    1372,05       8,73        8,23   8154,91   7000,00  10045,22 10046,00

     43790,000   9800,00   3536,13   6099,42     164,45     230,32    1796,09       5,86        9,62   8351,23   7000,00  10250,00 10250,00
     43790,000  10400,00   3607,39   6591,48     201,13     230,40    1821,72       5,91        9,70   8335,49   7000,00  10250,00 10250,00

     44145,000   9800,00   4735,84   4972,00      92,15     230,85    1449,24       7,64        9,25   8666,78   7000,00  11000,00 11000,00
     44145,000  10400,00   4836,58   5436,00     127,42     230,93    1513,48       7,71        9,33   8660,64   7000,00  11000,00 11000,00

   * 44530,000   9800,00   5826,89   2520,46    1452,65     232,21    1357,86       8,24        9,61   9006,85   7000,00  10551,26 11000,00
   * 44530,000  10400,00   5972,71   2798,96    1628,33     232,28    1390,55       8,36        9,68   8999,90   7000,00  10560,04 11000,00

   * 44925,000   9800,00   5155,62   1199,17    3445,21     233,93    1731,32       8,30       10,03   9433,69   7000,00  11209,31 11250,00
   * 44925,000  10400,00   5304,71   1327,17    3768,13     233,98    1771,71       8,48       10,08   9431,77   7000,00  11236,27 11250,00

     45330,000   9800,00   5818,59   2898,18    1083,23     234,88     711,77       6,11       10,68   9781,01   6400,00  10492,78 10500,00
     45330,000  10400,00   6091,49   3081,08    1227,43     234,95     713,10       6,34       10,75   9779,69   6400,00  10492,79 10500,00

     45430,000  10100,00   5334,23   2289,44    2476,33     235,30    2099,78       4,58       11,20   9382,57   6400,00  11500,00 11500,00
     45430,000  10700,00   5394,16   2479,69    2826,15     235,43    2104,19       4,56       11,33   9382,04   6400,00  11500,00 11500,00

   * 45526,000  10100,00   5312,95   1736,56    3050,49     235,58    1696,93       7,62       10,58   9570,41   6300,00  11300,00 11300,00
   * 45526,000  10700,00   5507,79   1856,24    3335,97     235,62    1700,55       8,05       10,62   9566,86   6300,00  11300,00 11300,00

     45740,000  10200,00   6794,42   1627,59    1777,99     235,94    1424,96       6,88       10,34   9569,01   6640,00  11226,79 11500,00
     45740,000  10800,00   7098,63   1748,45    1952,92     235,99    1450,92       7,14       10,39   9567,16   6640,00  11237,82 11500,00

     46030,000  10200,00   4719,42   3115,39    2365,20     236,40    1084,77       5,98       10,80   9545,75   8000,00  10650,52 11000,00
     46030,000  10800,00   4869,55   3355,65    2574,80     236,49    1117,25       6,10       10,89   9545,74   8000,00  10665,00 11000,00

   * 46435,000  10200,00   6284,44    296,76    3618,80     237,42    2152,86       7,89       11,12   9683,03      0,00  13100,37     0,00
   * 46435,000  10800,00   6448,51    342,81    4008,69     237,48    2172,57       8,04       11,18   9676,24      0,00  13100,63     0,00

     46905,000  10200,00   4715,64   1187,27    4297,08     238,40    1670,60       6,28       10,70   9696,85      0,00  12691,18     0,00
     46905,000  10800,00   4824,99   1270,13    4704,87     238,48    1697,46       6,36       10,78   9691,27      0,00  12691,88     0,00

     47240,000  10200,00   4210,63   4402,31    1587,06     238,59    1039,47       6,59       10,99   9684,10   7452,00  11204,44 12000,00
     47240,000  10800,00   4390,48   4631,43    1778,09     238,66    1094,41       6,81       11,06   9677,42   7452,00  11211,40 12000,00

     47580,000  10200,00   4501,42   5145,87     552,71     239,07    1728,15       7,43       11,67   9288,64   7255,00  11016,78 11500,00
     47580,000  10800,00   4475,87   5468,73     855,39     239,21    1754,54       7,26       11,81   9288,36   7255,00  11042,89 11500,00
```

```
      SECNO        Q         QCH       QLOB       QROB      CWSEL    TOPWID       VCH     DEPTH      SSTA     STENCL     ENDST    STENCR

    47890.000  10200.00    4278.74   5424.64    496.62    239.62   1162.35      6.56     12.22    9144.37    7262.00  10306.71  12000.00
    47890.000  10800.00    4430.02   5806.80    563.18    239.69   1173.66      6.74     12.29    9144.24    7262.00  10317.91  12000.00

    48115.000  10200.00    7568.83   2516.99    114.18    239.49    757.76      8.93     10.79    9179.32    7221.00  10593.12  12000.00
    48115.000  10800.00    7973.72   2691.62    134.66    239.53    834.74      9.34     10.83    9176.28    7221.00  10608.72  12000.00

    48173.000  10400.00    6691.60   2758.09    950.32    241.22   1699.86      5.86     12.02    9601.22    8151.00  11468.47  12000.00
    48173.000  11000.00    6667.12   2882.92   1449.95    241.52   1862.08      5.62     12.32    9601.21    8151.00  11484.07  12000.00

 ✓  48435.000  10400.00    8514.70   1701.75    183.55    240.75    584.68     10.53      9.95    9599.99    7756.00  10301.76  11000.00
    48435.000  11000.00    8709.33   1894.72    395.95    241.09    764.43     10.19     10.29    9599.42    7756.00  10403.51  11000.00

    48835.000  10400.00    5424.94   4975.06      0.00    242.58    896.03      6.57     10.68    9141.66    7321.00  10081.00  10081.00
    48835.000  11000.00    5556.47   5443.53      0.00    242.70    907.42      6.60     10.80    9135.76    7321.00  10081.00  10081.00

    49280.000  10400.00    2811.71   3873.44   3714.85    243.22   2090.94      3.00     11.32    8671.09       0.00  10771.90      0.00
    49280.000  11000.00    2858.05   4190.12   3951.83    243.34   2099.83      3.00     11.44    8664.25       0.00  10772.74      0.00

    49465.000  10400.00    2631.71   6714.62   1053.67    243.26   1974.21      4.50     12.16    8717.63       0.00  10761.59      0.00
    49465.000  11000.00    2647.27   7116.66   1236.07    243.38   2006.51      4.44     12.28    8707.04       0.00  10762.24      0.00

 *  49780.000  10400.00    4031.17   4551.72   1817.11    243.41   1922.28      8.16      9.11    8817.92       0.00  11058.11      0.00
 *  49780.000  11000.00    4140.72   4850.27   2009.01    243.45   1955.50      8.31      9.15    8801.72       0.00  11058.31      0.00

    50390.000  10400.00    2270.86   3602.15   4526.99    244.39   2075.34      4.37     12.29    9316.50       0.00  11460.15      0.00
    50390.000  11000.00    2329.53   3773.28   4897.19    244.45   2084.79      4.44     12.35    9316.38       0.00  11460.37      0.00

    50725.000  10400.00    1892.24    593.16   7914.60    244.59   1696.14      3.25      9.79    9154.06       0.00  11608.96      0.00
    50725.000  11000.00    1970.70    632.71   8396.60    244.66   1719.71      3.35      9.86    9153.89       0.00  11609.16      0.00

 *  51055.000  10400.00    5593.77   4806.23      0.00    246.19    855.18      9.70     11.19    9183.84    9000.00  10039.03  10040.00
 *  51055.000  11000.00    5756.11   5243.89      0.00    246.26    862.56      9.88     11.26    9176.71    9000.00  10039.27  10040.00

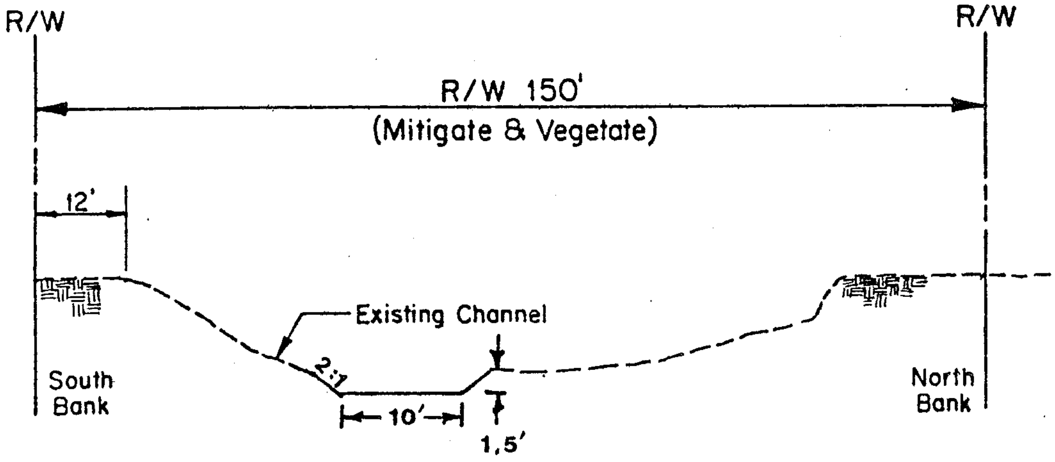
    51075.000  10400.00    7442.77   2957.23      0.00    246.80    846.41      9.22     10.50    9242.98    9200.00  10089.39  10090.00
    51075.000  11000.00    7683.69   3316.31      0.00    246.90    864.65      9.34     10.60    9225.35    9200.00  10090.00  10090.00


 SUMMARY OF ERRORS
```

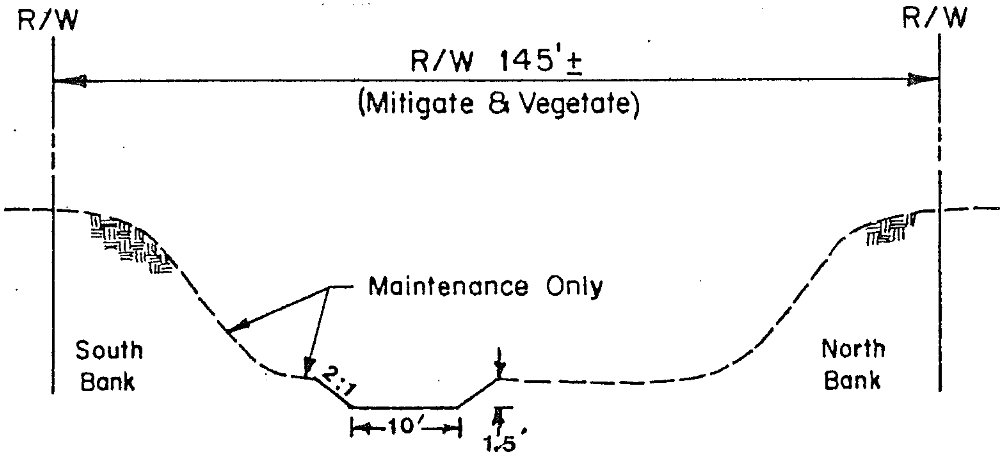
Reach 5

Reach 5 extends from station 498+15 to 522+00 on Llagas Creek. This trapezoidal earth channel was excavated to rough grade in 1972 by CalTrans. The proposed work is to stabilize the bottom and sides. Also included is a low flow channel to provide for fish migration. One drop structure will be incorporated and will have a fish ladder.

MAIN BRANCH LLAGAS CREEK



STA. 517+00 (South Valley Fwy.) To STA. 522+00 (Murphy Ave)



STA. 498+15 (Confluence W/East Little Llagas) To STA. 517+00 (South Valley Fwy)

CONFLUENCE WITH EAST LITTLE LLAGAS CR. TO MURPHY AVENUE

STA. 498+15 To STA. 523+50

REACH 5

FIGURE 6

Calif
LLHansen
Reach 4 Upper

Upper Llagas

Cost

* Concrete	454 cy @ $350/cy	158827
Veg		6620
Pilot Channel		4820
Subtotal		170267
Mobilization	3%	5108
Subtotal		175375
Contingency	12%	21045
Total		196,420
** R/W		

* Reduce concrete for lower flow 2004
** Previously purchased R/W

Reach 5 Noncohesive soil (channel has been rocked lined)

496+15 – 522+00

1 drop structures.

488 × 350 = 170,800

15% Contigency 25620

196,420

Contengency
12% Construction
3% Vegitation and pilot channel
Erosion Planting
2.1 ac @ 1000 = 2100
1.2 ac @ 3770 4520 ← See Reach 3
6620

Pilot Channel
d = 1.5′
ss = 2:1
b = 10′
ℓ = 2385′
Cost = $2.80/cy

$$Vol = \frac{bd+zd^2}{27}(\ell)$$

$$= \left[1.5(10)+2(1.5)^2\right]\frac{(2385)}{27} = 1723\ cy$$

Cost = 1723(2.80) 4820

$11440

3%
170,800(.03) = $5123
11440 > 5123 NG

drop structure sized for 5000 cfs actually 4000 cfs from extrapolation in table $\frac{488+270}{2} = 379$ cy

Cost = 379 @ 350 = $132650

∴ 170800 – 132650 = $38150 more dollars than actually needed

∴ Therefore there are enough dollars to cover the extra cost of Vegetation and pilot channel use calculated value previously done.

4/25/81

Calif
LL Hansen 8/11/81
Previous Work

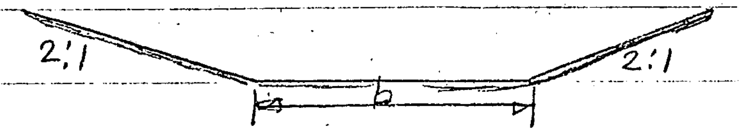
Upper Llagas

from SCVWD

R/W 4 acres -$31,000

Reach 5

existing channel capacity
excavated by the State



			Q
LC2 501+84	b = 69.2'	S = 0.0004	2385 cfs
LC2 505+00	b = 66.4	"	2388 cfs
LC2 506+92	b = 64.6	"	2423 cfs
LC2 510+00	b = 62.0	"	2909 cfs

LC2 514+00 LLogas Creek Bridge

$8.8/69.2 = 0.1272 \qquad K' = 0.0517$

$$Q = 0.0517 \frac{(69.2)^{8/3}(0.0004)^{1/2}}{0.035} = 2385$$

$d/b = 9/66.4 = 0.1355 \qquad K' = 0.0578$

$$Q = 0.0578 \frac{(66.4)^{8/3}(0.0004)^{1/2}}{0.035} = 2388$$

$d/b = 9.2/64.6 = 0.1424 \qquad K' = 0.0631$

$$Q = 0.0631 \frac{(64.6)^{8/3}(0.0004)^{1/2}}{0.035} = 2423$$

$d/b = 10.4/62 = 0.1677$

$K' = 0.0846$

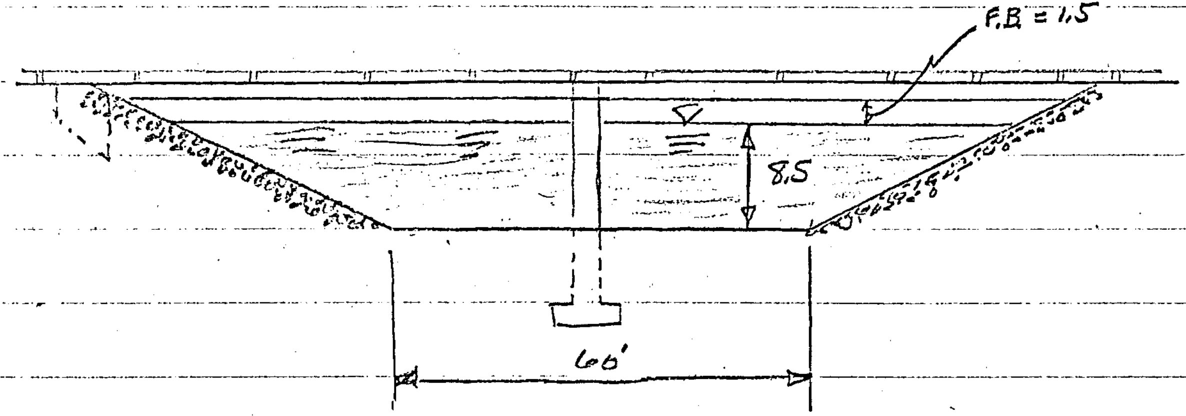
$$Q = 0.0846 \frac{(62)^{8/3}(0.0004)^{1/2}}{0.035}$$

$= 2909$ cfs

Reach 5

LLAGAS CREEK BRIDGE

4 Miles N. OF GILROY



S=0.0018

$d/b = 8.5/60 = 0.1417$

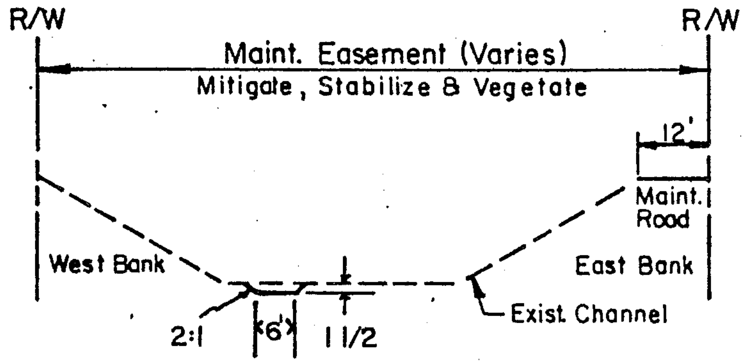
$K' = 0.0626$

$$Q = 0.0626 \frac{(60)^{8/3} (0.0018)^{1/2}}{0.035} = 4{,}184 \text{ c.f.s.}$$

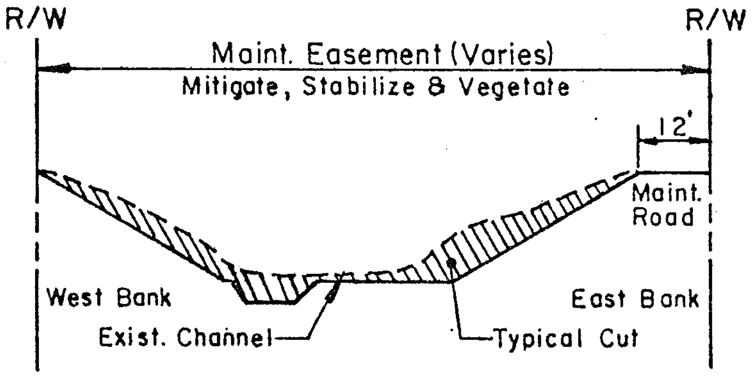
Reach 6a

This reach extends from station 522+00 to 714+70 on Llagas Creek. This is an existing earth channel. The proposed work will enlarge the channel sufficiently to preclude induced damage from the work to be done on Reaches 7a, 7b, 8a, and 8b. A low flow channel will be included for fish migration.

MAIN BRANCH LLAGAS CREEK



STA 546+70 (Church) To STA 661+00 (1100' d/s Llagas)



STA 522+00 (Murphy) To STA 546+70 (Church)

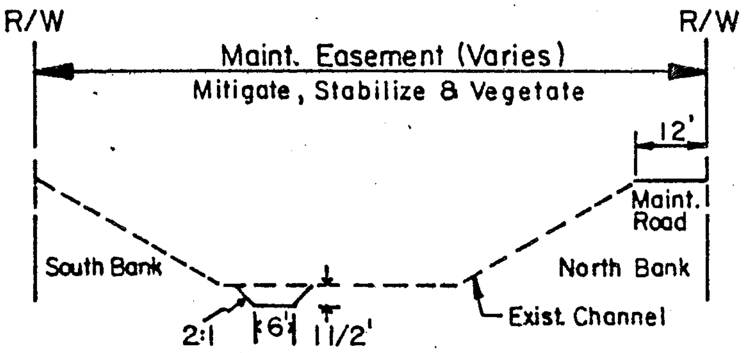
MURPHY AVE. TO CONFLUENCE WITH WEST LITTLE LLAGAS CREEK

(STA 522+00 To STA 714+70)

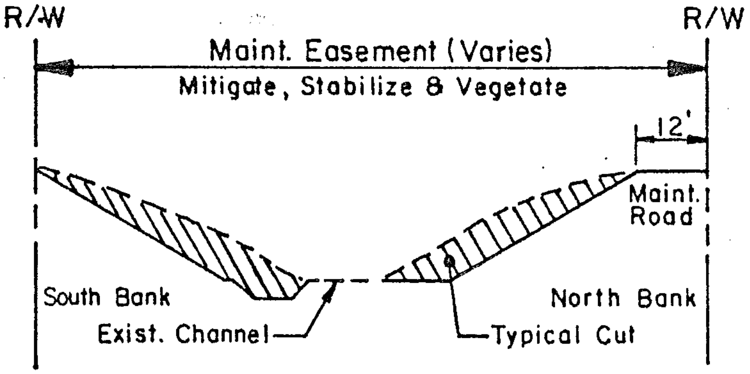
REACH 6A

FIGURE 7

MAIN BRANCH LLAGAS CREEK



STA 684+50 (Monterey) To STA 714+70 (Confluence w/ West Little Llagas)



STA 661+00 (1100' d/s Llagas Ave) To STA 684+50 (Monterey Rd)

MURPHY AVE. TO CONFLUENCE WITH WEST LITTLE LLAGAS CREEK

(STA 522+00 To STA 714+70)

REACH 6A

(CONT.)

FIGURE 8

79

LLAGAS CREEK - SUPPLEMENTAL MODIFIED WORK PLAN

ESTIMATE OF CHANNEL COSTS

REACH NO. 6A Case 10

Item	Quantity	Unit Cost	
Channel Excavation	32581 ~~22946~~ ~~22,000~~	2.8 C.Y.	91227 ~~64249~~ ~~61,600~~
Compacted Embankment			
Drop Structures			
Drainage Inlets			
Riprap			
Filter Stone			
Seeding	1 Ac	2000 Ac	2000
Landscaping			
Structural Excavation			
Rectangular Concrete Channel			
Compacted Backfill			
Levee Embankment			
Site Preparation (Levees)	1 Ac	1150 Ac	1150
Mobilization		3%.	~~2022~~ ~~1943~~ 2831

Subtotal ~~69,421~~ 97208 ~~66,693~~

10/12
~~15%~~ Contingency ~~8330~~ ~~8003~~ 11665

TOTAL ~~74696~~
~~77,751~~ 108873

7/31/81

LLAGAS CREEK - SUPPLEMENTAL MODIFIED WORK PLAN

ESTIMATE OF OTHER CONSTRUCTION COSTS

REACH NO. 6A

Item	Quantity	Unit Cost	$
State and County Bridges			
Private Bridges			
RCB Culverts			
Relocation of Utilities			

Subtotal ________

15% Contingency ________

TOTAL ________

ESTIMATED COST OF LAND PURCHASE

Item	Quantity	Unit Cost	$
Creek Bottom	50.3	200	10062
Agricultural			
Potential Residential (low value)			
Potential Residential (medium value)	~~2.10~~ X	20,000	42734
Residential/School			
Dwellings			

TOTAL 52796

X 2.13 ac @ 10000 = 21350
2.85 ac @ 7500 = 21384
$42734

7/27/81

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   MODI   ATION -  50,51,52
******* ***************************          *********

NOTE= ASTERISK (*) AT LEFT OF CROSS-SECTION NUMBER INDICATES MESSAGE IN SUMMARY OF ERRORS LIST

LLAGAS CREEK       Reach 6A (AFTER EXCAVATION)

SUMMARY PRINTOUT


      SECNO         Q         QCH       QLOB       QROB       .01K      CWSEL     STENCL     STENCR     TOPWID      ELMIN      AREA      I

    52005.000   5100.00   5099.95      0.05       0.00    1615.45    248.14    9947.00   10066.00     119.00     238.80     877.15     32
  ✓ 52005.000   5700.00   5698.73      1.27       0.00    2138.96    249.54    9947.00   10066.00     119.00     238.80    1043.74     17

  ✓ 52370.000   5300.00   5101.77    198.23       0.00    1436.60    248.45    9870.00   10060.00     190.00     239.00     850.64     09
    52370.000   5900.00   5277.76    622.24       0.00    2046.29    249.80    9870.00   10060.00     190.00     239.00    1109.70     82

  ✓ 52660.000   5400.00   5400.00      0.00       0.00    1337.72    248.79    9761.00   10083.00     109.83     239.40     760.02     10
    52660.000   6000.00   5977.19     22.81       0.00    1695.89    249.92    9761.00   10083.00     321.48     239.40     922.43     74

  ✓ 52720.000   5400.00   5400.00      0.00       0.00     944.30    248.54    9720.00   10599.00     103.03     241.40     599.02     01
    52720.000   6000.00   6000.00      0.00       0.00    1235.54    249.74    9720.00   10599.00     111.48     241.40     727.29     25

  * 52946.000   5400.00   5399.85      0.15       0.00    1709.73    252.43    9946.00   10059.00     113.00     242.00     889.49     07
  ✓ 52946.000   6000.00   6000.00      0.00       0.00     938.27    249.68    9946.00   10059.00     101.41     242.00     593.35     11

  ✓ 53055.000   5400.00   5400.00      0.00       0.00    2191.43    252.69       0.00       0.00     114.10     241.70    1047.28     16
    53055.000   6000.00   6000.00      0.00       0.00    1550.85    250.80       0.00       0.00     110.20     241.70     833.24     20

    53575.000   4000.00   4000.00      0.00       0.00     730.86    252.18       0.00       0.00      63.13     242.30     430.46     29
  * 53575.000   4100.00   4100.00      0.00       0.00     452.72    250.03       0.00       0.00      54.62     242.30     303.97     49

  ✓ 53960.000   4000.00   4000.00      0.00       0.00    1503.47    253.73       0.00       0.00     107.52     243.10     809.62     94
    53960.000   4100.00   4100.00      0.00       0.00    1414.23    253.40       0.00       0.00     105.39     243.10     774.08     30

  ✓ 54310.000   4000.00   4000.00      0.00       0.00    1156.92    253.87       0.00       0.00      88.32     244.70     643.42     22
    54310.000   4100.00   4100.00      0.00       0.00    1088.11    253.58       0.00       0.00      87.76     244.70     617.71     64

  ✓ 54775.000   5000.00   5000.00      0.00       0.00    1308.74    254.42       0.00       0.00     111.67     245.70     753.34     64
    54775.000   5600.00   5600.00      0.00       0.00    1243.44    254.20       0.00       0.00     111.01     245.70     728.19     69

  ✓ 55085.000   5000.00   5000.00      0.00       0.00     756.07    254.32       0.00       0.00      79.15     246.60     474.89     53
    55085.000   5600.00   5600.00      0.00       0.00     708.90    254.06       0.00       0.00      77.93     246.60     453.91     54

 ok 55455.000   5000.00   4600.95      0.00     399.05     667.50    256.24    9941.00   10550.00     517.76     232.80    6358 31     63
    55455.000   5600.00   5197.25      0.00     402.75     798.94    256.94    9941.00   10550.00     566.22     232.80    6741 31     48
```

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      ...05,000    5900,00   5897,27      2,73         0,00   1435,27     266,6     9600,00  10 8,00    371,46     257,       27,65    6
  ✓  59260,000    5300,00   530          0,00         0,00   1910,70     266,9     9445,00  10335,00   272,54     258,30    201,30    4
     59260,000    5900,00   5899, 8      0,02         0,00   2188,21     267,35    9445,00  10335,00   283,08     258,30   1314,84    4

  ✓  59575,000    5300,00   5300,00      0,00         0,00   1054,83     266,69    9916,00  10097,00   128,28     259,20    623,07    8
     59575,000    5900,00   5900,00      0,00         0,00   1167,71     267,02    9916,00  10097,00   129,68     259,20    665,41    8

  ✓  59965,000    5300,00   5300,00      0,00         0,00   1016,69     267,66    9930,00  10112,00   127,35     260,10    607,65    8
     59965,000    5900,00   5900,00      0,00         0,00   1133,85     268,00    9930,00  10112,00   128,98     260,10    652,31    9

  ✓  60350,000    5300,00   5300,00      0,00         0,00   1288,23     268,79    9341,00  10129,00   125,70     260,70    698,67    7
     60350,000    5900,00   5900,00      0,00         0,00   1412,19     269,15    9341,00  10129,00   127,50     260,70    742,75    7

     60630,000    5300,00   5300,00      0,00         0,00    877,59     269,06    9926,00  10085,00   128,91     262,30    559,27    9
  ✓  60630,000    5900,00   5900,00      0,00         0,00    994,90     269,43    9926,00  10085,00   130,96     262,30    607,00    9

  ✓  60925,000    5300,00   5295,02      0,00         4,98   1162,32     270,38    9604,00  10171,00   161,87     262,40    691,35    7
     60925,000    5900,00   5876,34      0,00        23,66   1295,08     270,76    9604,00  10171,00   182,72     262,40    756,90    7

  ✓  61290,000    5300,00   5300,00      0,00         0,00    901,15     270,92    9787,00  10337,00   117,78     263,40    547,93    9
     61290,000    5900,00   5900,00      0,00         0,00    996,45     271,25    9787,00  10337,00   120,90     263,40    588,18   10

  ✓  61670,000    5300,00   5300,00      0,00         0,00   1283,43     272,45    9843,00  10075,00   129,78     265,10    705,80    7
     61670,000    5900,00   5900,00      0,00         0,00   1427,25     272,83    9843,00  10075,00   131,35     265,10    756,22    7




       SECNO          Q         QCH        QLOB        QROB      .01K       CWSEL     STENCL    STENCR     TOPWID      ELMIN      AREA       VI

  ✓  62090,000    5300,00   5300,00      0,00         0,00   1696,90     273,44    9763,00  10400,00   196,10     265,50    981,49    5.
     62090,000    5900,00   5900,00      0,00         0,00   1927,08     273,67    9763,00  10400,00   198,87     265,50   1065,53    5.

 *✓  62525,000    5300,00   5300,00      0,00         0,00    683,55     274,47    9892,00  10333,00   109,69     267,20    453,25   11,
  *  62525,000    5900,00   5900,00      0,00         0,00    769,84     274,60    9892,00  10333,00   111,54     267,20    490,18   12,

  ✓  62910,000    5300,00   5300,00      0,00         0,00   1159,10     276,83    9000,00  10064,00   109,11     268,30    620,90    8,
     62910,000    5900,00   5900,00      0,00         0,00   1274,59     277,20    9000,00  10064,00   110,60     268,30    661,27    8,

  ✓  63300,000    5300,00   5300,00      0,00         0,00   1096,38     277,72    9881,00  10088,00   122,63     269,80    627,21    8,
     63300,000    5900,00   5900,00      0,00         0,00   1229,65     278,13    9881,00  10088,00   125,68     269,80    678,69    8,

  ✓  63677,000    5300,00   5300,00      0,00         0,00    801,34     278,39    9672,00  10187,00   112,10     270,80    501,15   10,
     63677,000    5900,00   5900,00      0,00         0,00    900,39     278,77    9672,00  10187,00   115,43     270,80    543,85   10
```

*	6[illegible]00,000	5900,00	5900,0	0,00	0,00	1229,65	278,13	[illegible]981,00	1008[illegible]	125,68	269,80	[illegible],69	,69
✓	63677,000	5300,00	5300,00	0,00	0,00	801,34	278,39	72,00	10187,00	112,10	270,80	,15	,58
	63677,000	5900,00	5900,00	0,00	0,00	900,39	278,77	9672,00	10187,00	115,43	270,80	543,85	,85
✓*	63985,000	5300,00	5300,00	0,00	0,00	703,16	280,08	9886,00	10227,00	92,43	273,10	429,36	,34
*	63985,000	5900,00	5900,00	0,00	0,00	789,07	280,47	9886,00	10227,00	95,35	273,10	465,97	,66
✓	64125,000	5300,00	5300,00	0,00	0,00	1007,11	281,68	9919,00	10045,00	103,44	274,30	557,96	,50
	64125,000	5900,00	5900,00	0,00	0,00	1123,08	282,10	9919,00	10045,00	106,29	274,30	602,32	,80
✓	64186,000	5300,00	5300,00	0,00	0,00	1010,37	281,96	9946,00	10057,00	94,41	274,40	540,08	,81
	64186,000	5900,00	5900,00	0,00	0,00	1126,88	282,40	9946,00	10057,00	96,47	274,40	581,94	,14
✓	64280,000	5300,00	5300,00	0,00	0,00	952,77	282,09	9806,00	10049,00	89,32	273,70	510,11	,39
	64280,000	5900,00	5900,00	0,00	0,00	1056,75	282,51	9806,00	10049,00	91,50	273,70	546,32	,76
✓	64660,000	5300,00	5300,00	0,00	0,00	1218,84	283,63	9084,00	10052,00	105,15	274,70	630,24	,41
	64660,000	5900,00	5900,00	0,00	0,00	1366,10	284,11	9084,00	10052,00	107,64	274,70	681,54	,66
✓*	65010,000	5300,00	5300,00	0,00	0,00	714,57	283,43	9431,00	10120,00	76,63	275,60	404,62	,10
*	65010,000	5900,00	5900,00	0,00	0,00	796,09	283,86	9431,00	10120,00	78,82	275,60	437,46	,49
✓	65270,000	5300,00	5300,00	0,00	0,00	1159,88	285,93	9676,00	11000,00	107,07	275,50	616,48	,60
	65270,000	5900,00	5900,00	0,00	0,00	1316,57	286,47	9676,00	11000,00	111,69	275,50	676,58	,72
✓	65640,000	5300,00	5300,00	0,00	0,00	2403,79	287,04	0,00	0,00	115,88	277,10	998,52	,31
	65640,000	5900,00	5900,00	0,00	0,00	2632,98	287,57	0,00	0,00	116,95	277,10	1060,50	,56
✓*	66000,000	5300,00	5300,00	0,00	0,00	706,38	286,28	9953,00	11500,00	86,07	278,70	419,29	,64
*	66000,000	5900,00	5900,00	0,00	0,00	799,12	286,73	9953,00	11500,00	89,34	278,70	456,39	,87
	66450,000	5300,00	4934,73	365,27	0,00	1010,89	289,12	9924,00	10272,00	118,49	279,90	566,16	,97
	66450,000	5900,00	5415,39	484,61	0,00	1144,43	289,56	9924,00	10272,00	121,30	279,90	618,53	,17
✓	66975,000	5300,00	5279,89	0,00	20,11	1343,23	290,94	9847,00	12000,00	184,02	281,30	758,66	,12
	66975,000	5900,00	5834,27	0,00	65,73	1523,27	291,36	9847,00	12000,00	211,56	281,30	841,93	,28
*	67400,000	5300,00	5300,00	0,00	0,00	711,10	290,67	9934,00	12000,00	82,55	281,90	414,84	,78
*	67400,000	5900,00	5900,00	0,00	0,00	784,66	291,11	9934,00	12000,00	88,22	281,90	451,76	,06
	67760,000	5300,00	5300,00	0,00	0,00	2139,97	293,36	0,00	0,00	105,53	282,90	894,59	,92
	67760,000	5900,00	5900,00	0,00	0,00	2337,87	293,87	0,00	0,00	106,55	282,90	946,97	,22
	68220,000	5300,00	5300,00	0,00	0,00	1302,09	293,29	0,00	0,00	85,19	284,20	609,58	,69
	68220,000	5900,00	5900,00	0,00	0,00	1433,85	293,79	0,00	0,00	87,17	284,20	652,21	,05

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      SECNO         Q           QCH        QLOB        QROB        .01K       CWSEL     STENCL     STENCR      TOPWID      ELMIN       AREA

   68605.000     5300.00     5300.00       0.00        0.00     1361.45      294.02       0.00       0.00       90.09      285.20      639.25
   68605.000     5900.00     5900.00       0.00        0.00     1510.29      294.54       0.00       0.00       92.19      285.20      687.02

   68720.000     5300.00     5300.00       0.00        0.00     1676.75      294.51       0.00       0.00      102.54      285.50      761.43
   68720.000     5900.00     5900.00       0.00        0.00     1862.78      295.06       0.00       0.00      104.74      285.50      818.47

   68764.000     5300.00     5300.00       0.00        0.00      941.83      294.65    9500.00   10069.00       97.30      286.20      524.02     1
   68764.000     5900.00     5900.00       0.00        0.00     1067.19      295.21    9500.00   10069.00      100.68      286.20      579.21     1

   68935.000     5300.00     5300.00       0.00        0.00     1563.25      295.73       0.00       0.00       92.12      286.10      701.54
   68935.000     5900.00     5900.00       0.00        0.00     1710.95      296.22       0.00       0.00       94.04      286.10      747.20

*  69185.000     5300.00     5300.00       0.00        0.00      715.11      295.24       0.00       0.00       70.00      286.80      392.56     1
*  69185.000     5900.00     5900.00       0.00        0.00      800.97      295.72       0.00       0.00       72.66      286.80      426.65     1

   69510.000     5300.00     5300.00       0.00        0.00     1008.02      297.51       0.00       0.00       83.95      288.60      517.35     1
   69510.000     5900.00     5900.00       0.00        0.00     1131.83      298.04       0.00       0.00       87.04      288.60      562.85     1
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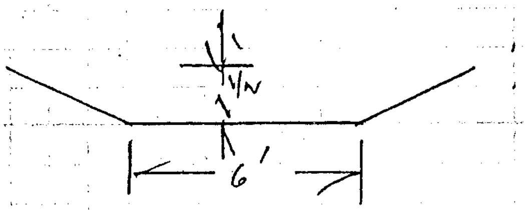
Calif Upper Llagas
LLHansen 7/31/81
Reach 6A

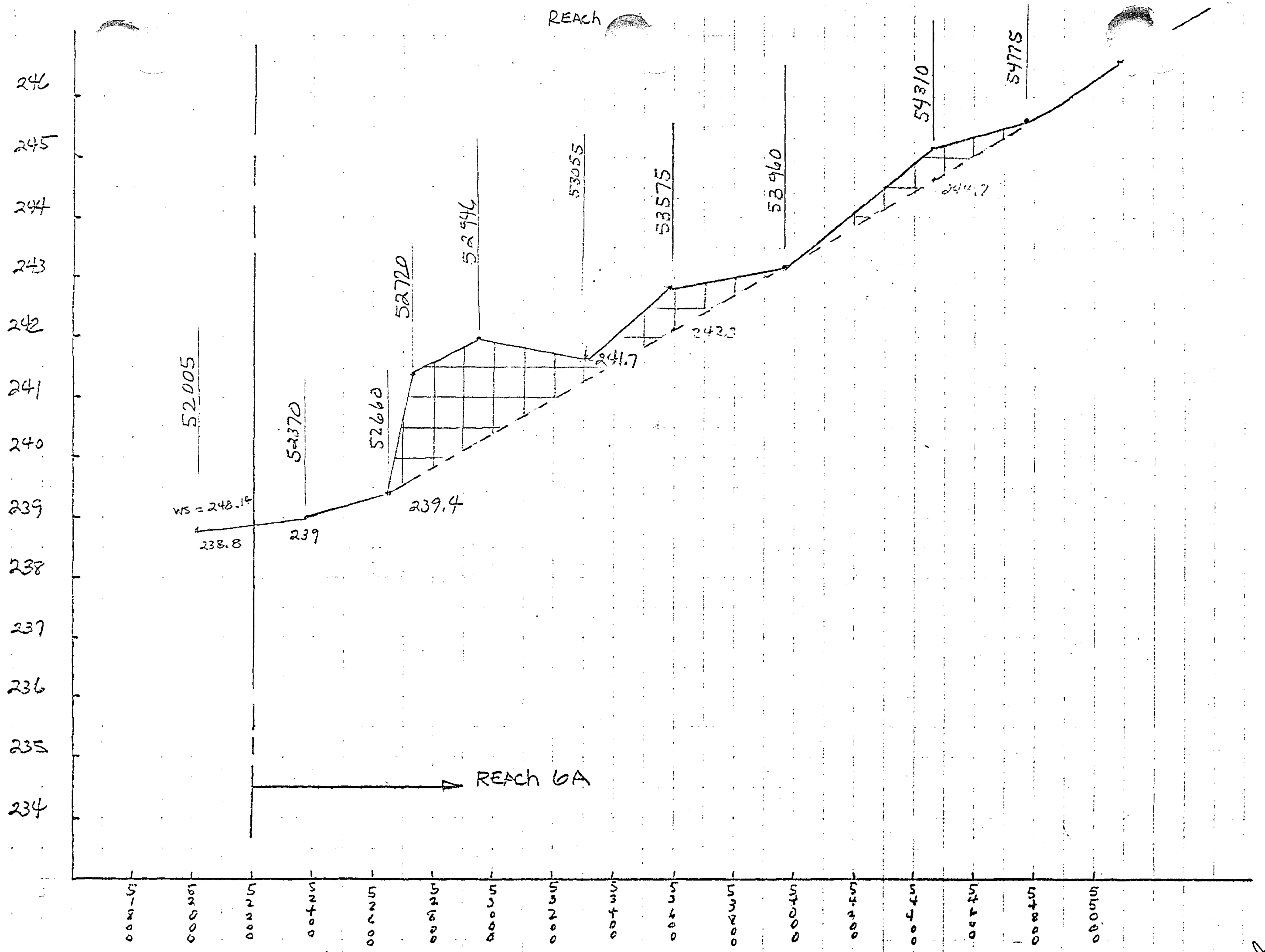
Low Flow Channel for fisheries



$$Vol/ft = \frac{6(1.5)+2(1.5)^2}{27} = 0.5\,cy/ft$$

L = -52200 + 71470 = 19270 ft

Vol = 19270(.5) = 9635 cy


REACH
REACH 6A
52005
52370
52660
52720
52946
53055
53575
53960
54310
54775
WS = 248.14
238.8
239
239.4
241.7
242.3
244.7
246
245
244
243
242
241
240
239
238
237
236
235
234
51800
52000
52200
52400
52600
52800
53000
53200
53400
53600
53800
54000
54200
54400
54600
54800
55000

BK
3/9/91

Reach 6A

Sta NO.	Length	sq. ft.
Sta 677+60	460	95.4
682+20	385	151
686+05	115	236.0
687+20	44	137.6
687+64	171	0
689+35	250	250.0
691+85	325	125.0
695+10		197.4

$$\text{Vol. of Earthwork} = \frac{95.4+151}{2} \times \frac{460}{27} + \frac{151+236}{2} \times \frac{385}{27} + \frac{236+137.6}{2} \times \frac{115}{27}$$

$$+ \frac{137.6+0}{2} \times \frac{44}{27} + \frac{0+250}{2} \times \frac{171}{27} + \frac{250+125}{2} \times \frac{250}{27}$$

$$+ \frac{125+197.4}{2} \times \frac{325}{27}$$

$= 10,234$ cubic yards

652+70	370	0	
656+40	360	256.5	3,468
660+00		0	

Total = 13,702 cy.

B.K
3/6/81
88

Reach 6A

earthwork Quantity

Sta	Length	SQ. feet/sta
53055	520	58.5
53575	385	51.0
53960	350	181.6
54310	465	149.6
54775		207.6

$$Vol = \frac{A_1 + A_2}{2} \times \frac{L}{27}$$

$$= \frac{58.5 + 51.0}{2} \times \frac{520}{27} + \frac{51 + 181.6}{2} \times \frac{385}{27} + \frac{181.6 + 149.6}{2} \times \frac{350}{27}$$

$$+ \frac{149.6 + 207.6}{2} \times \frac{465}{27}$$

= 7,935 cubic yards

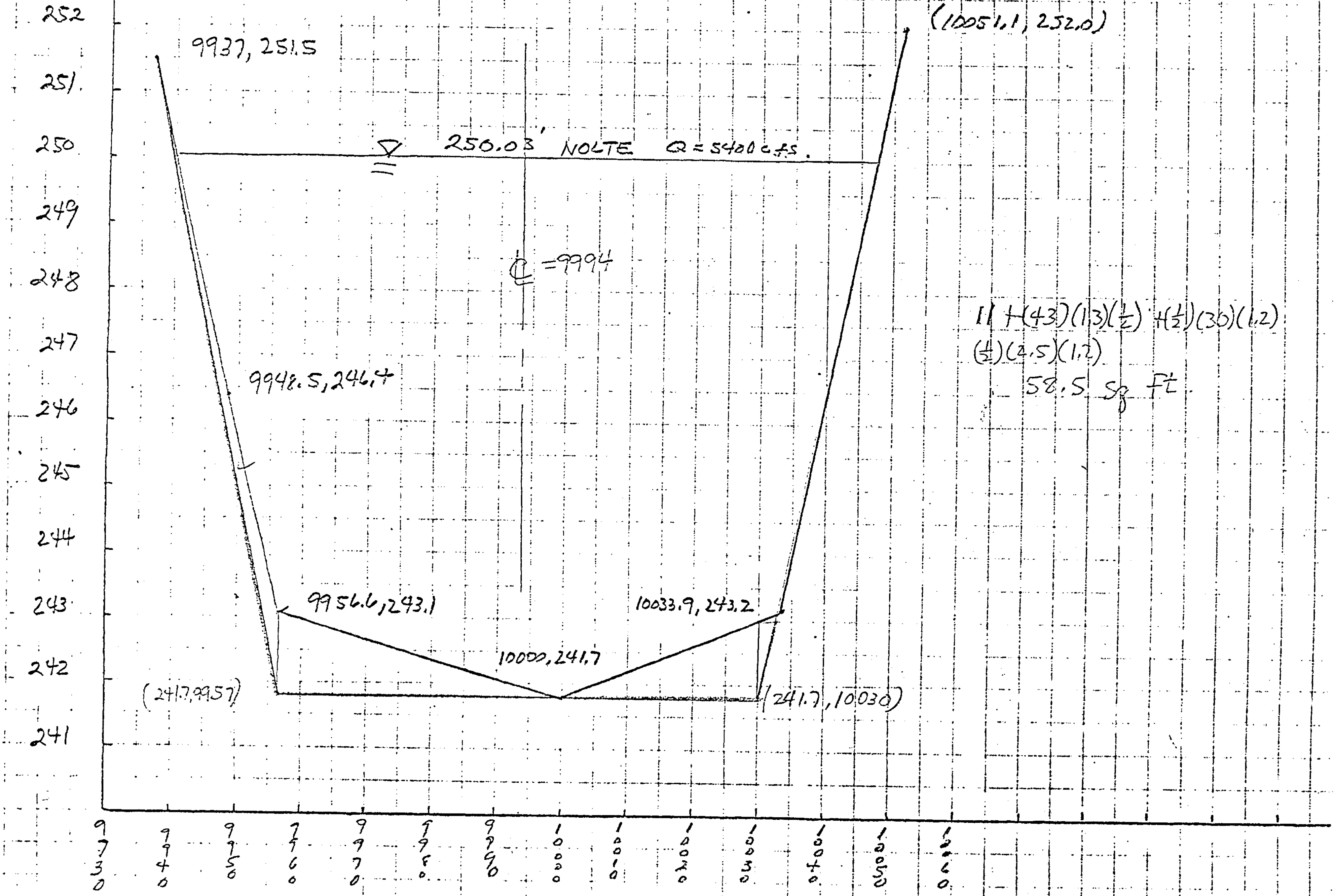
Total EARTHWORK = 7935 + 13,702 = $\boxed{\text{21,637 cobic yards}}$ + 1309 = $\underline{\underline{22946\ \text{cy}}}$

Clearing — length of channel to be cleared = 3470' l.f

Average width 12' X 3470 X $\frac{1}{43560}$ = 0.95 $\boxed{\text{use 1 Ac}}$

Seeding $\boxed{\text{use 1 Ac.}}$

X3 5[illegible]5

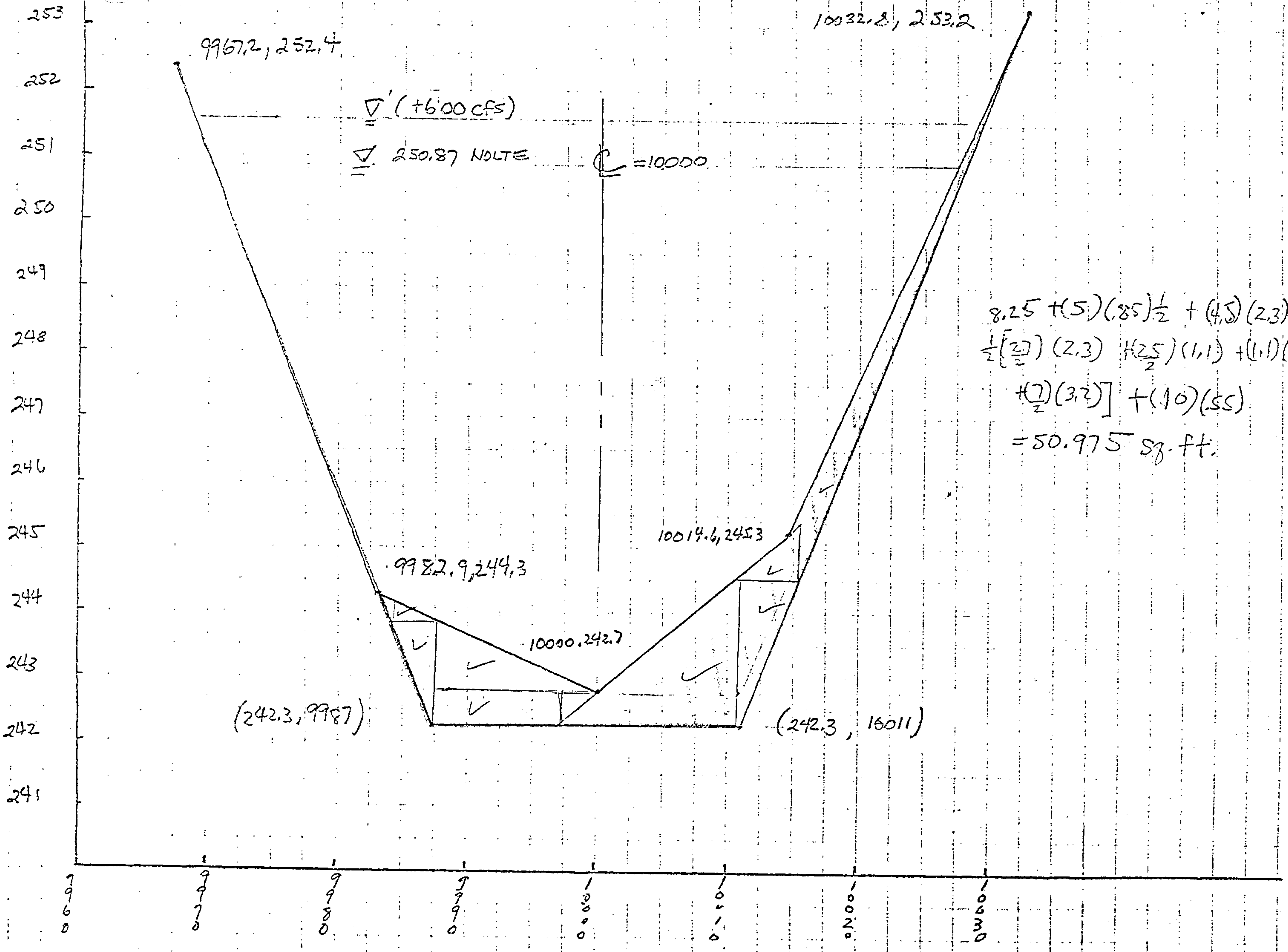


$11 + (43)(1.3)(\frac{1}{2}) + (\frac{1}{2})(30)(1.2)$

$(\frac{1}{2})(4.5)(1.2)$

58.5 Sq Ft

X-3 S:



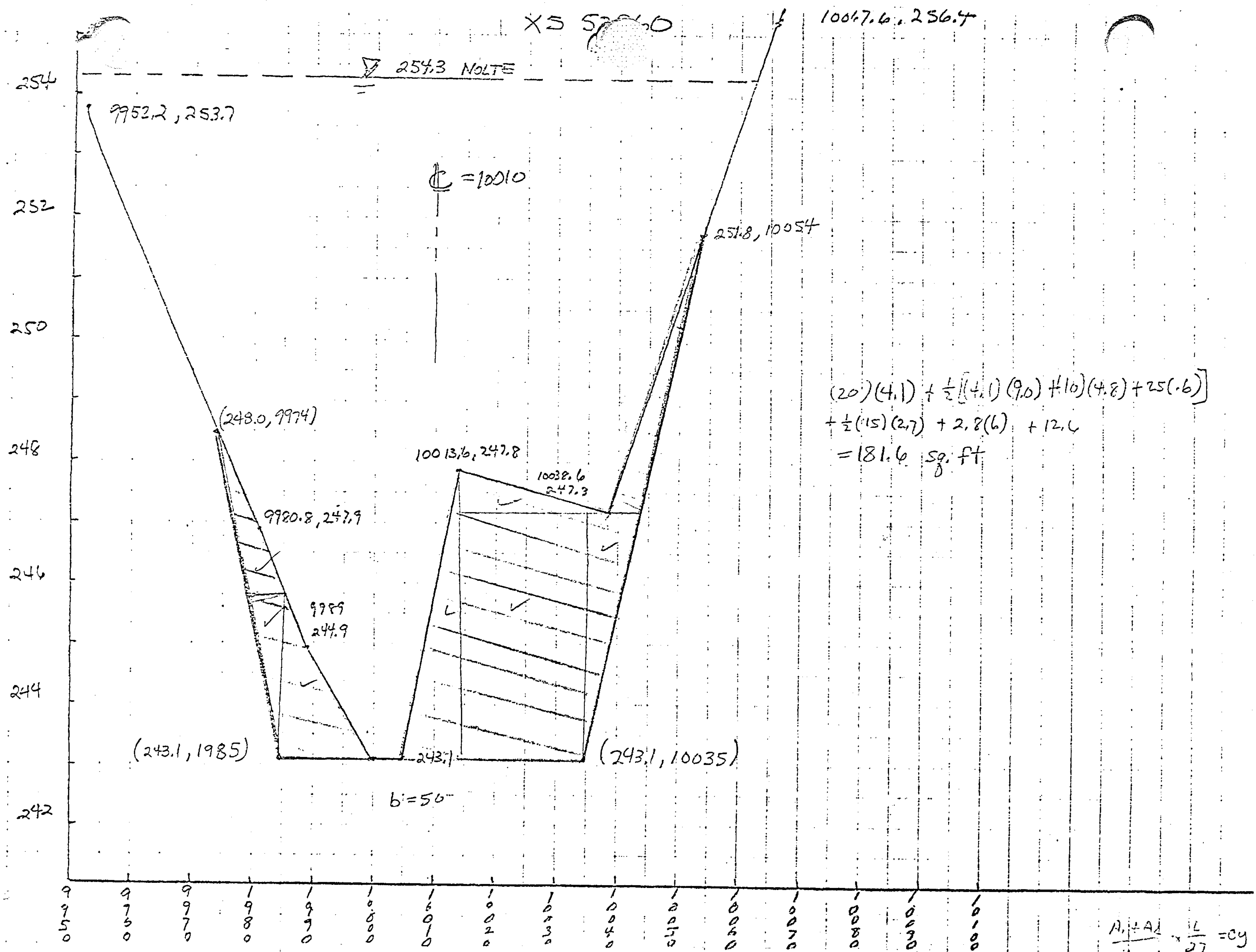
$$8.25 + (5)(.85)\frac{1}{2} + (4.5)(2.3)\frac{1}{2}$$

$$\frac{1}{2}\left[\left(\frac{2.7}{2}\right)(2.3) + \left(\frac{2.5}{2}\right)(1.1) + (1.1)\left(\frac{7}{2}\right)\right.$$

$$\left. + \left(\frac{7}{2}\right)(3.2)\right] + (10)(.55)$$

$$= 50.975 \text{ sq. ft.}$$

XS 5[illegible]0



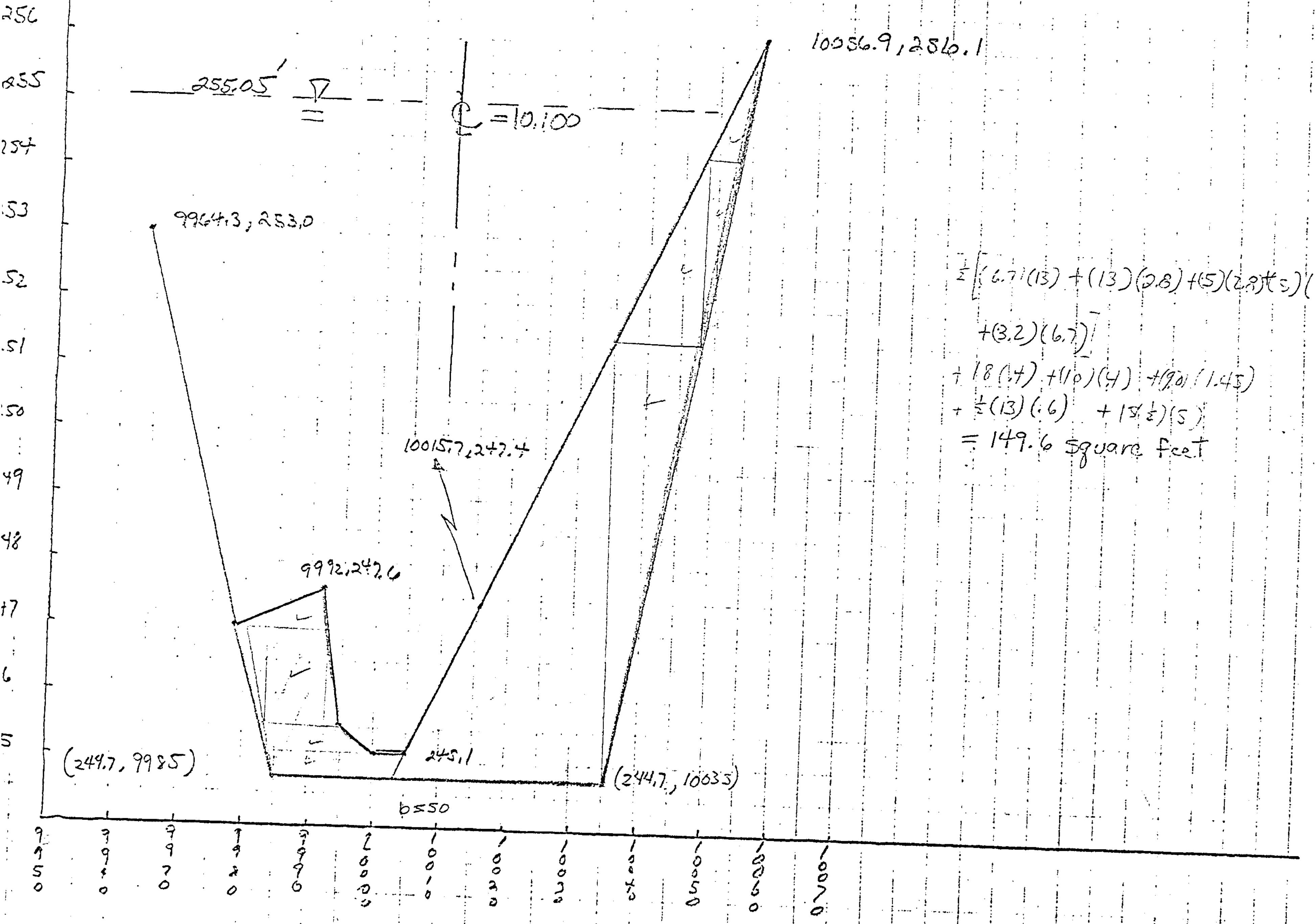
$(20')(4.1) + \frac{1}{2}[(4.1)(9.0) + (10)(4.8) + 25(.6)]$

$+ \frac{1}{2}(15)(2.7) + 2.8(6) + 12.6$

$= 181.6$ sq. ft

$\frac{A_1 + A_2}{2} \times \frac{L}{27} = cy$

XS: 5421



$\frac{1}{2}\left[(6.7)(13)+(13)(2.8)+(5)(2.8)+(5)(1.8)\right.$

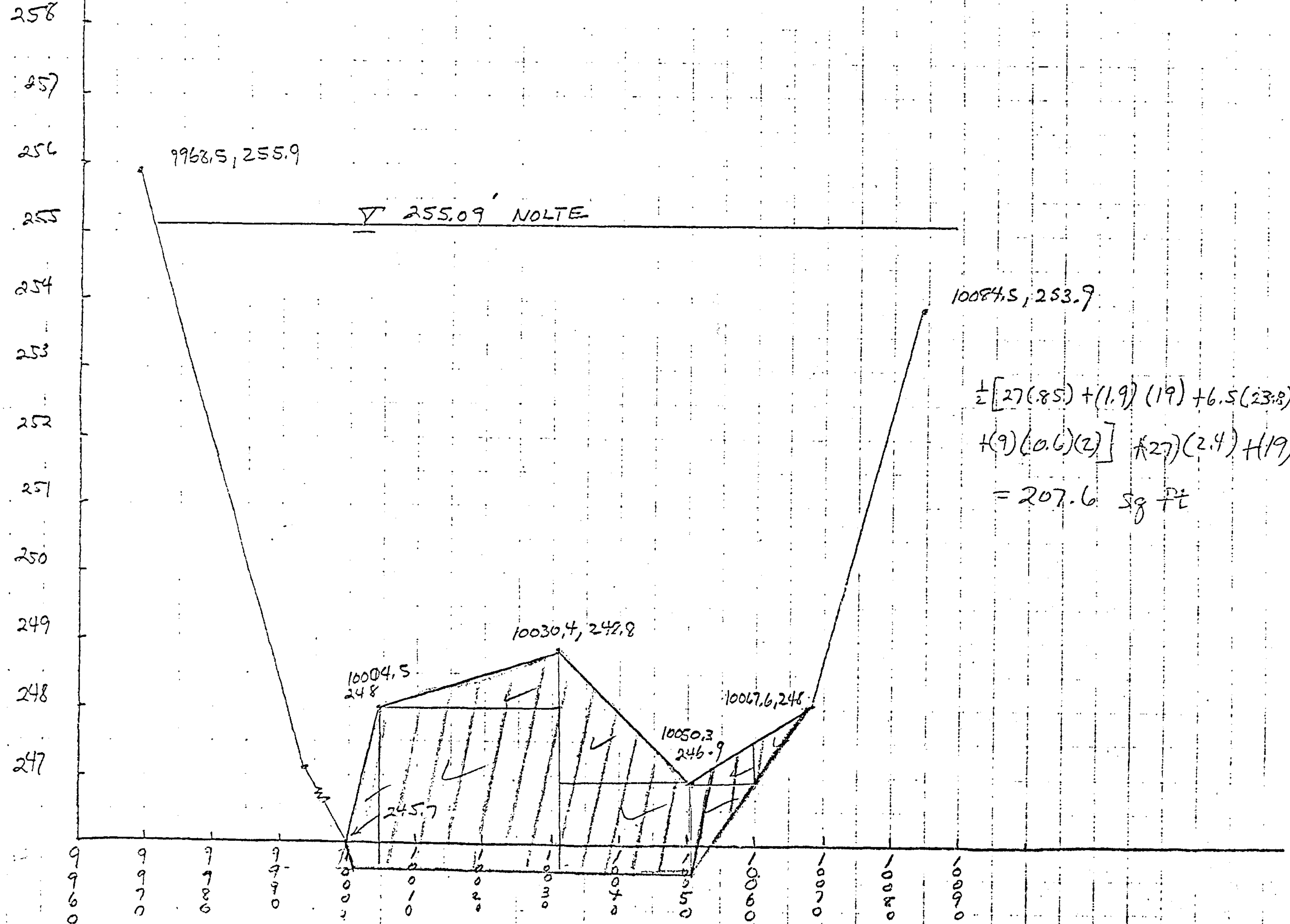
$\left.+(3.2)(6.7)\right]$

$+18(.4)+(10)(.4)+(9.0)(1.45)$

$+\frac{1}{2}(13)(.6) \quad +15(\tfrac{1}{2})(5)$

$=149.6$ square feet

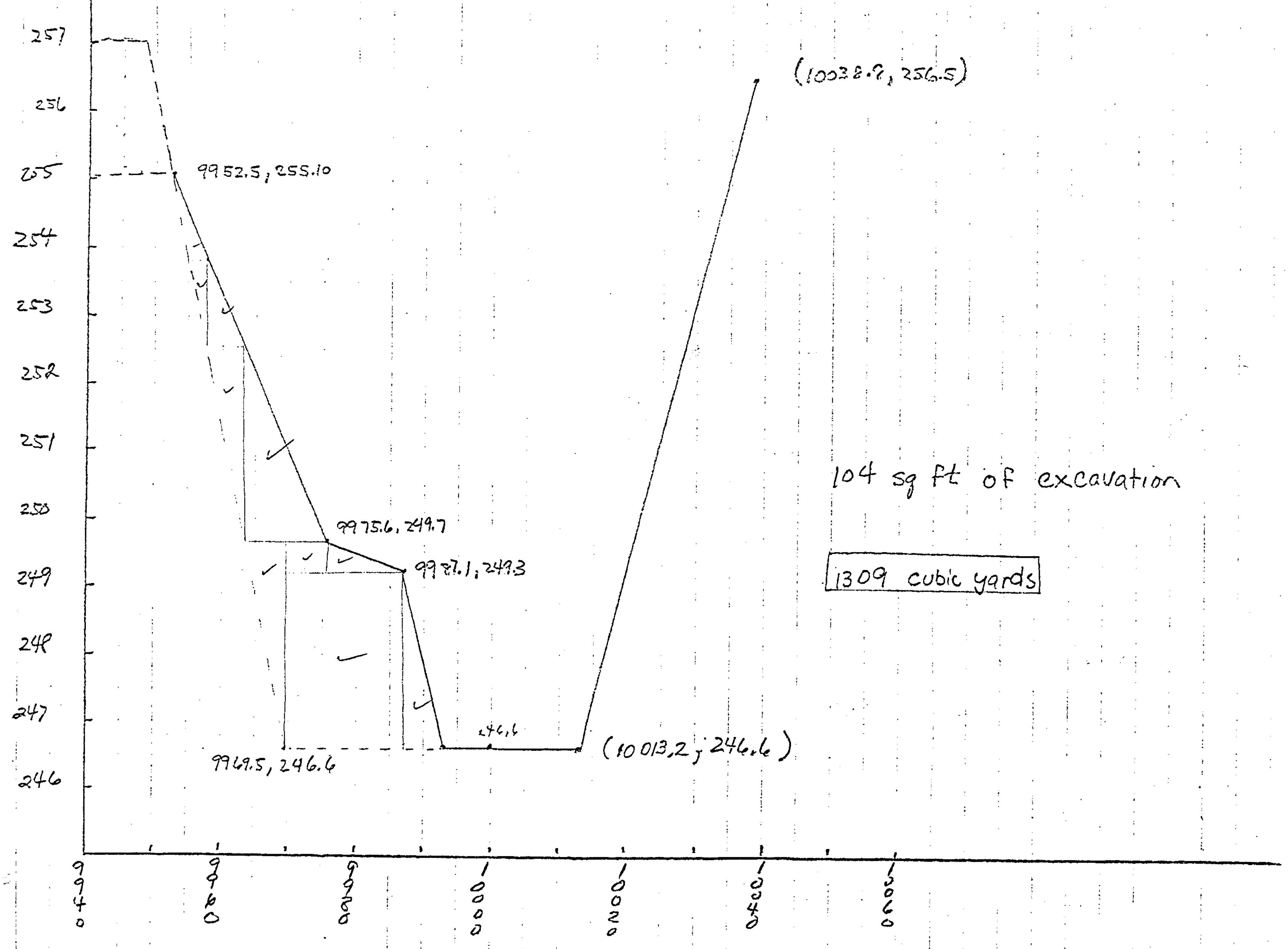
XS 547



$$\tfrac{1}{2}\left[27(.85)+(1.9)(19)+6.5(23.8)+(9)(1.3)+(9)(0.6)(2)\right]+(27)(2.4)+(19)(1.3)$$

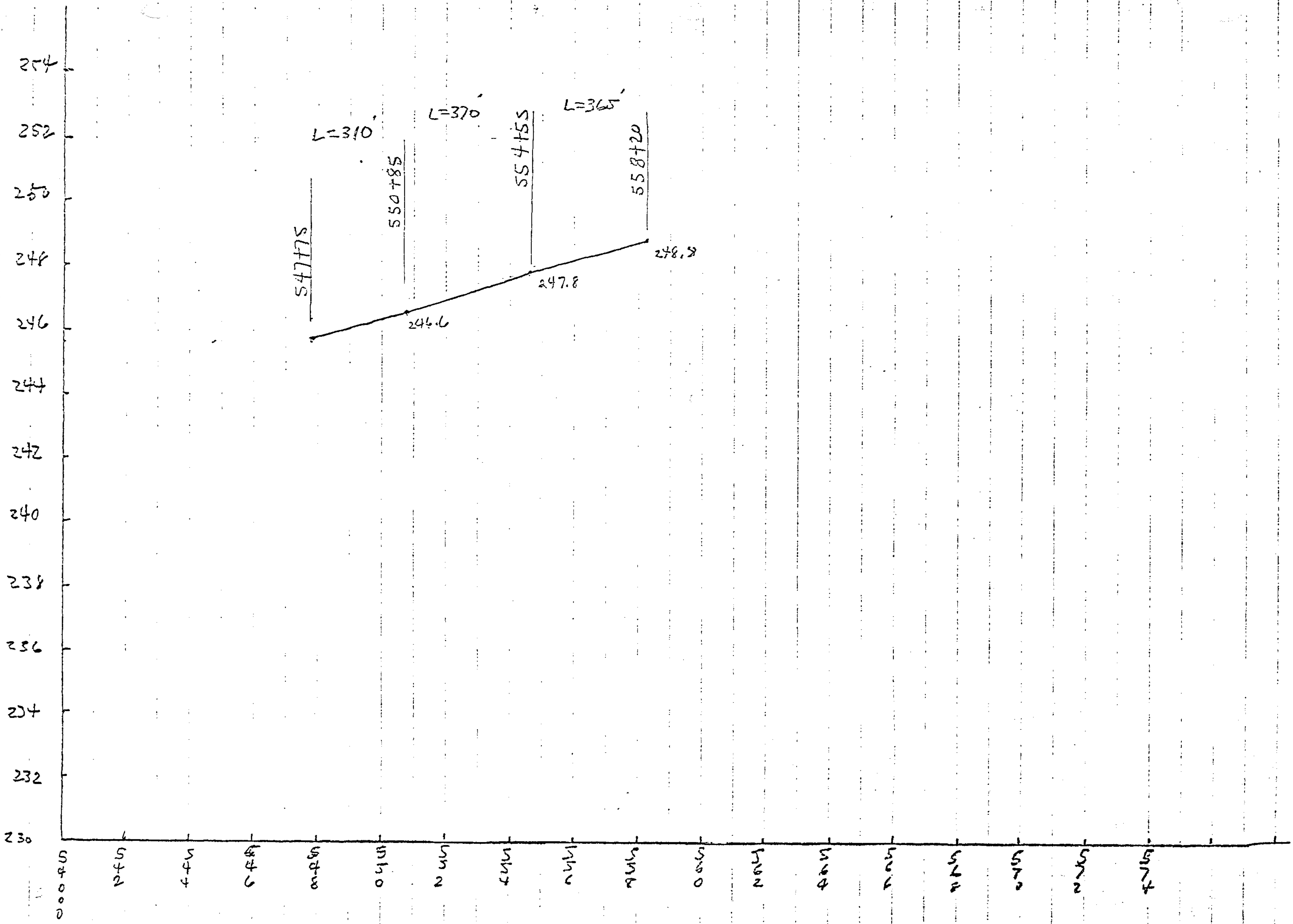
$$=207.6 \text{ Sq Ft}$$

XS 5 5
550+85



104 sq ft of excavation

$\boxed{\text{1309 cubic yards}}$


254
252
250
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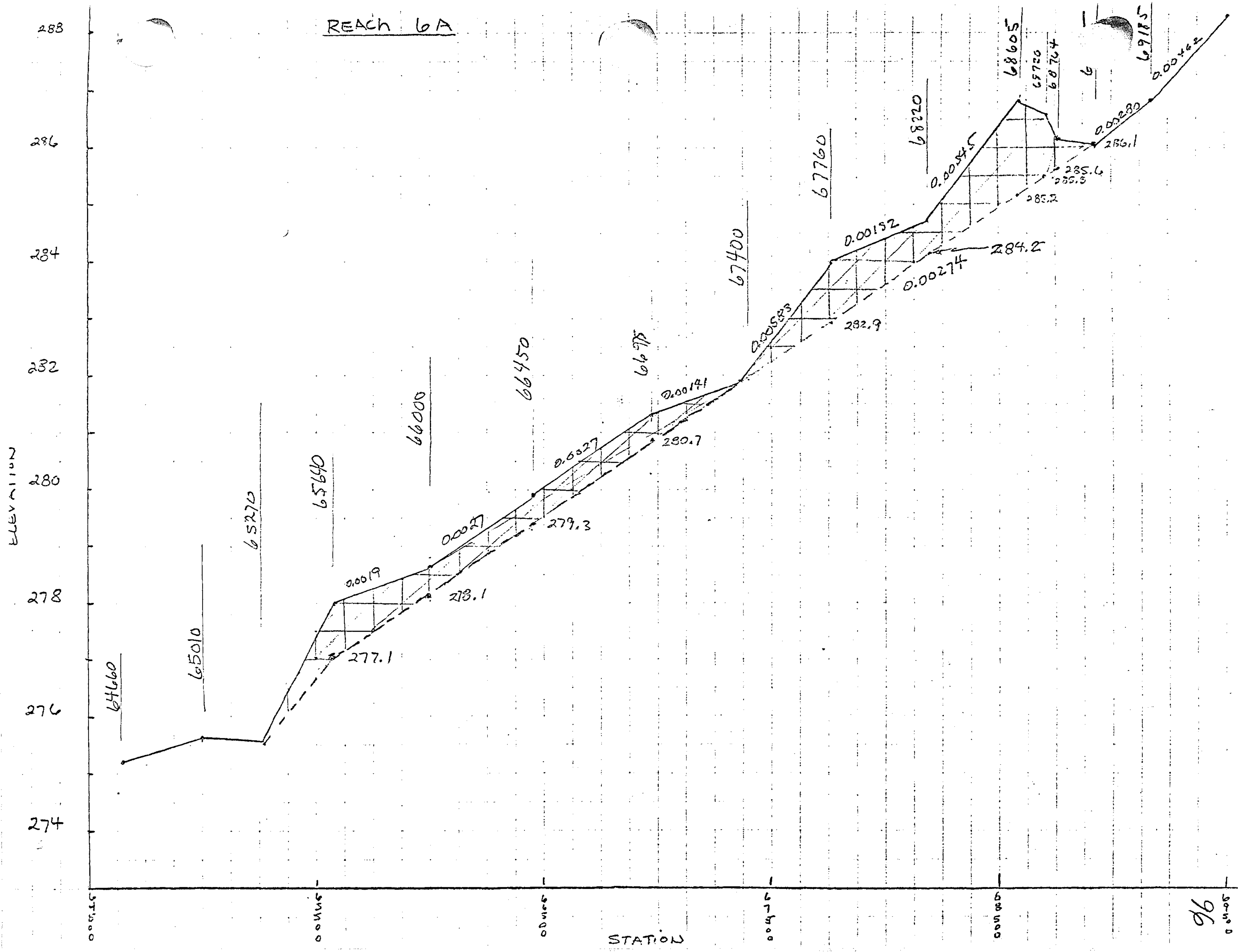
246
244
242
240
238
236
234
232
230
540+00
542
544
546
548
550
552
554
556
558
560
562
564
566
568
570
572
574
L=310'
L=370'
L=365'
547+75
550+85
554+55
558+20
246.6
247.8
248.8

REACH 6A



288
286
284
282
280
278
276
274
ELEVATION
64500
65500
66500
67500
68500
69500
STATION
64660
65010
65270
65640
66000
66450
66975
67400
67760
68220
68605
68720
68764
6
69185
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0.0027
0.0027
0.00141
0.00583
0.00152
0.00545
0.00280
0.00462
0.00274
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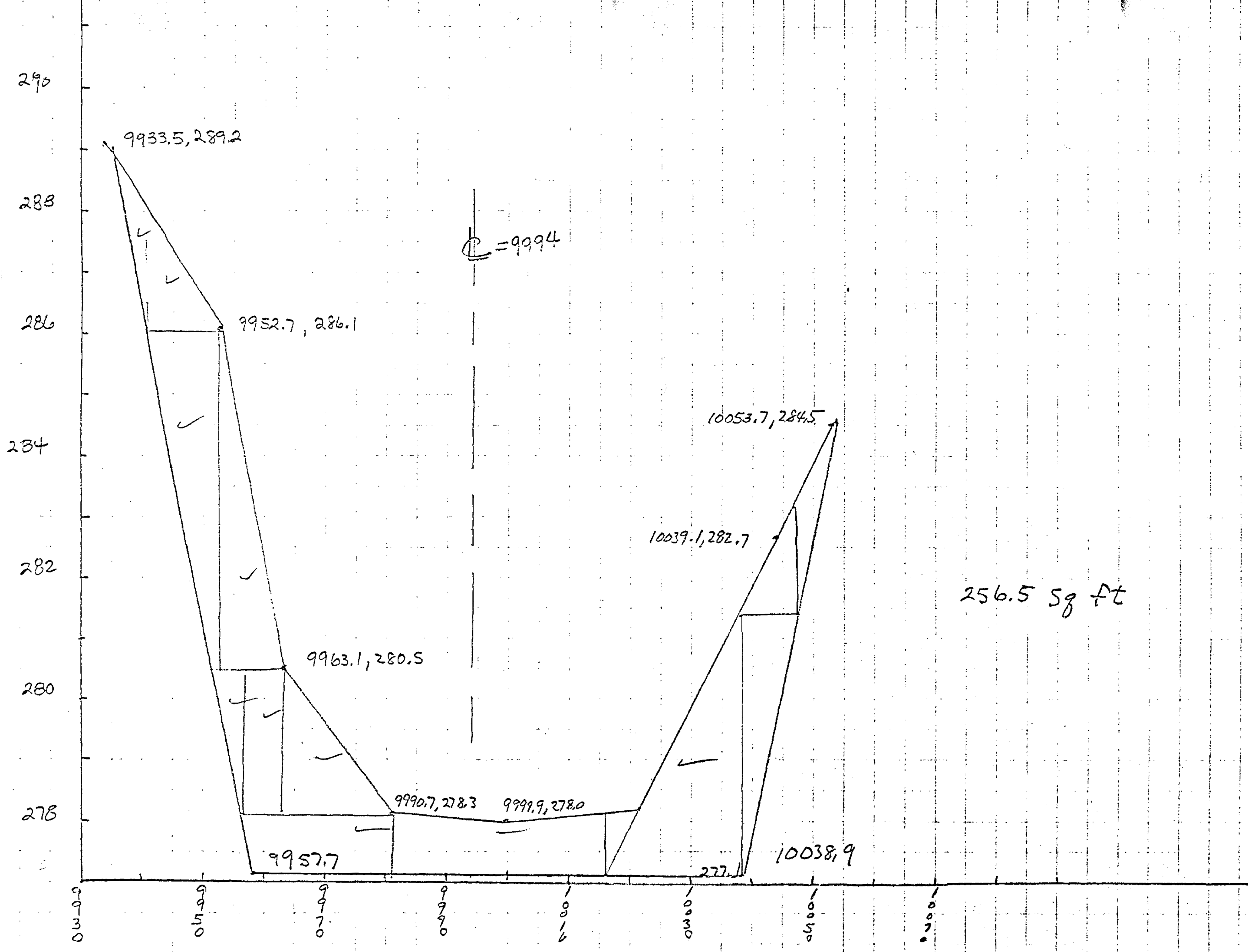
278.1
279.3
280.7
282.9
284.2
285.2
285.5
285.6
286.1

XS 65640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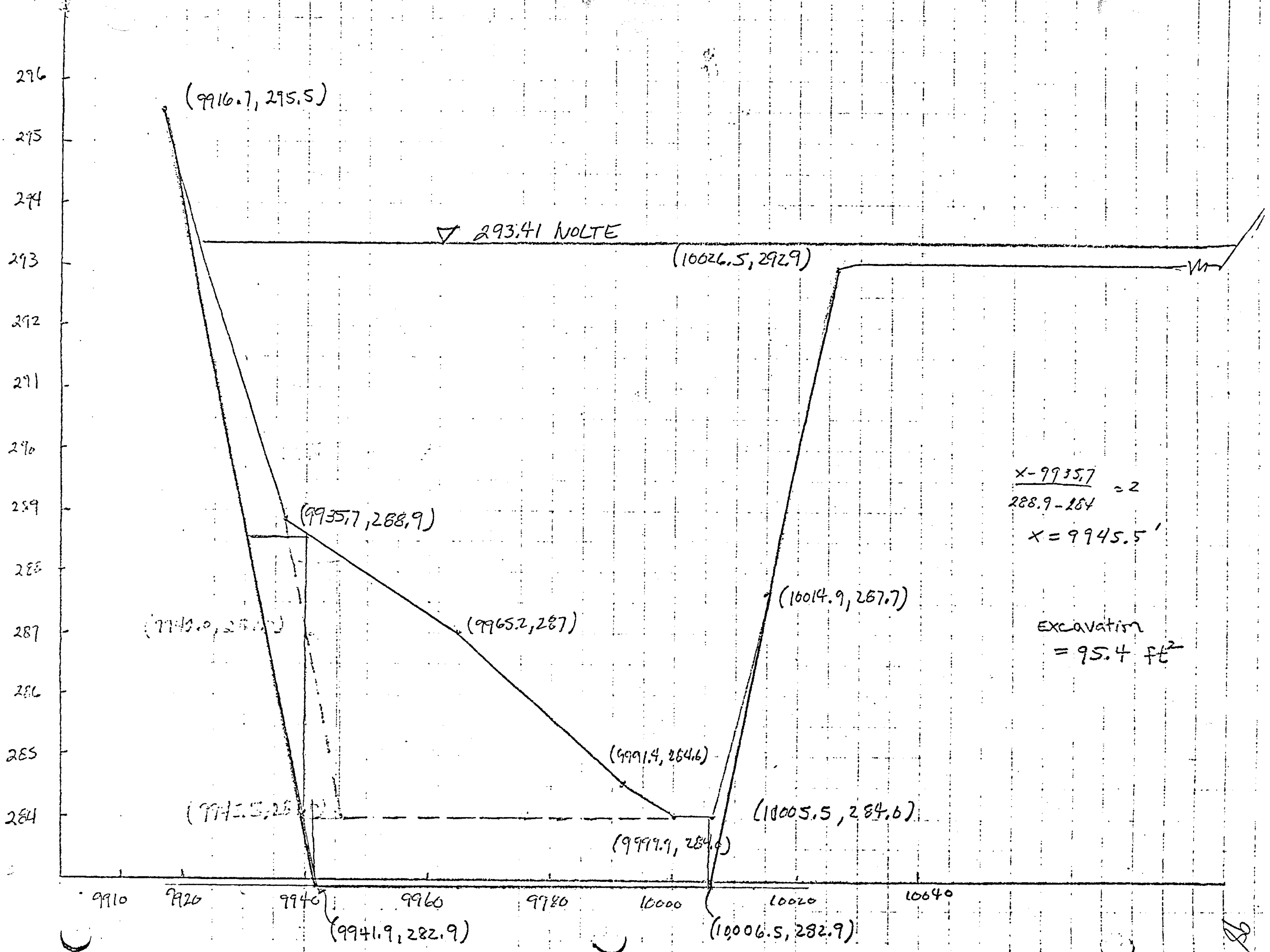
288
286
284
282
280
278
9933.5, 289.2
9952.7 , 286.1
9963.1, 280.5
9990.7, 278.3
9991.9, 278.0
9957.7
277.1
10038.9
10039.1, 282.7
10053.7, 284.5
℄ =9994
256.5 Sq ft
9930
9950
9970
9990
10010
10030
10050
10070

X-5 67760 Reach 6A



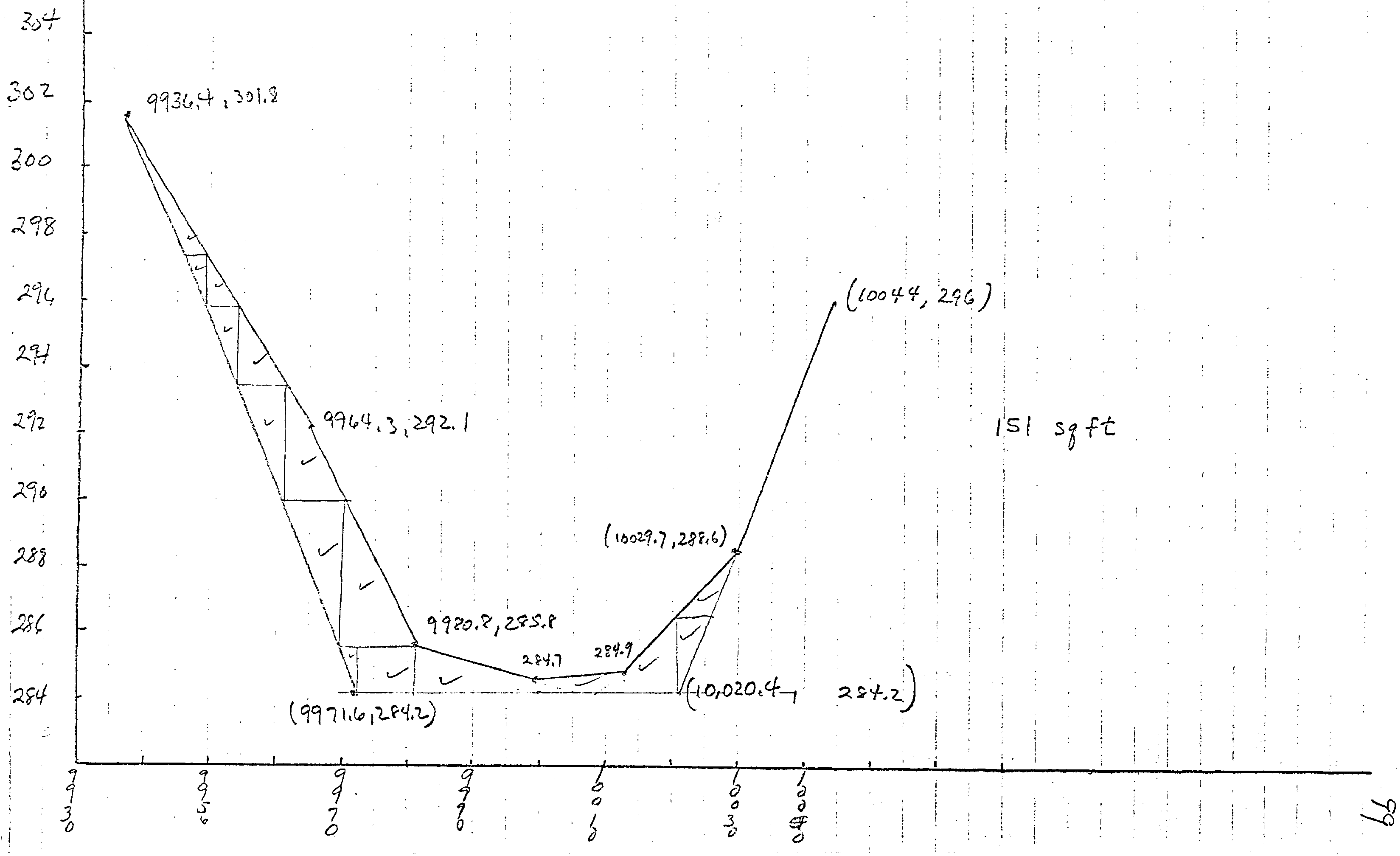
$\frac{x-9935.7}{288.9-284}=2$

$x = 9945.5'$

Excavatin

$= 95.4 \text{ ft}^2$

XS 67220

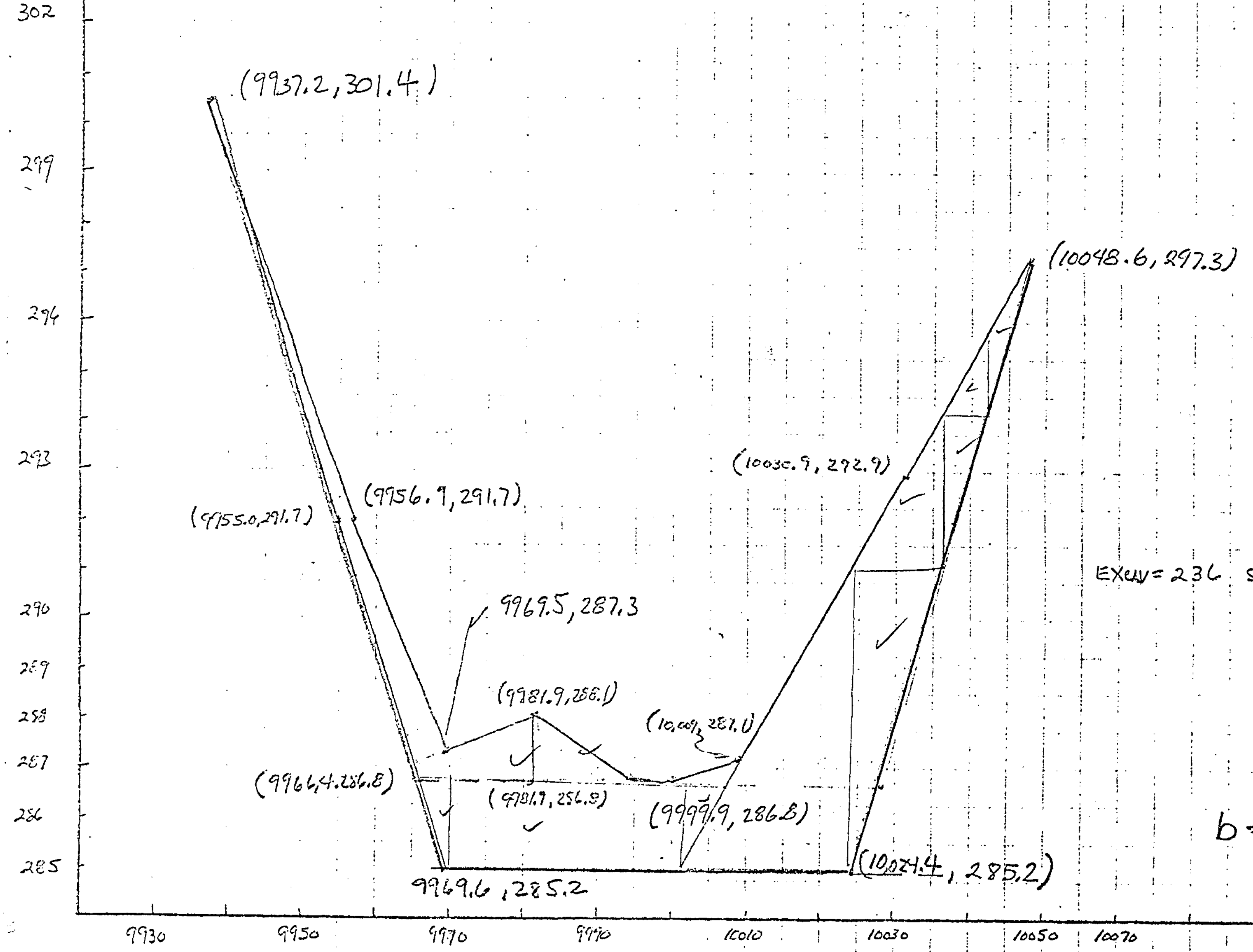

304
302
300
298
296
294
292
290
288
286
284
9936.4, 301.8
9964.3, 292.1
9980.8, 285.8
284.7
284.9
(9971.6, 284.2)
(10029.7, 288.6)
(10,020.4 284.2)
(10044, 296)
151 sq ft
9930
9950
9970
9990
10010
10030
10040

XS 68605 Reach 6A

$\frac{x - 9937.2}{301.4 - 286.8} = 2$

$x = 9966.4$

$T = 111.4$



$V_{original} = 7.10$

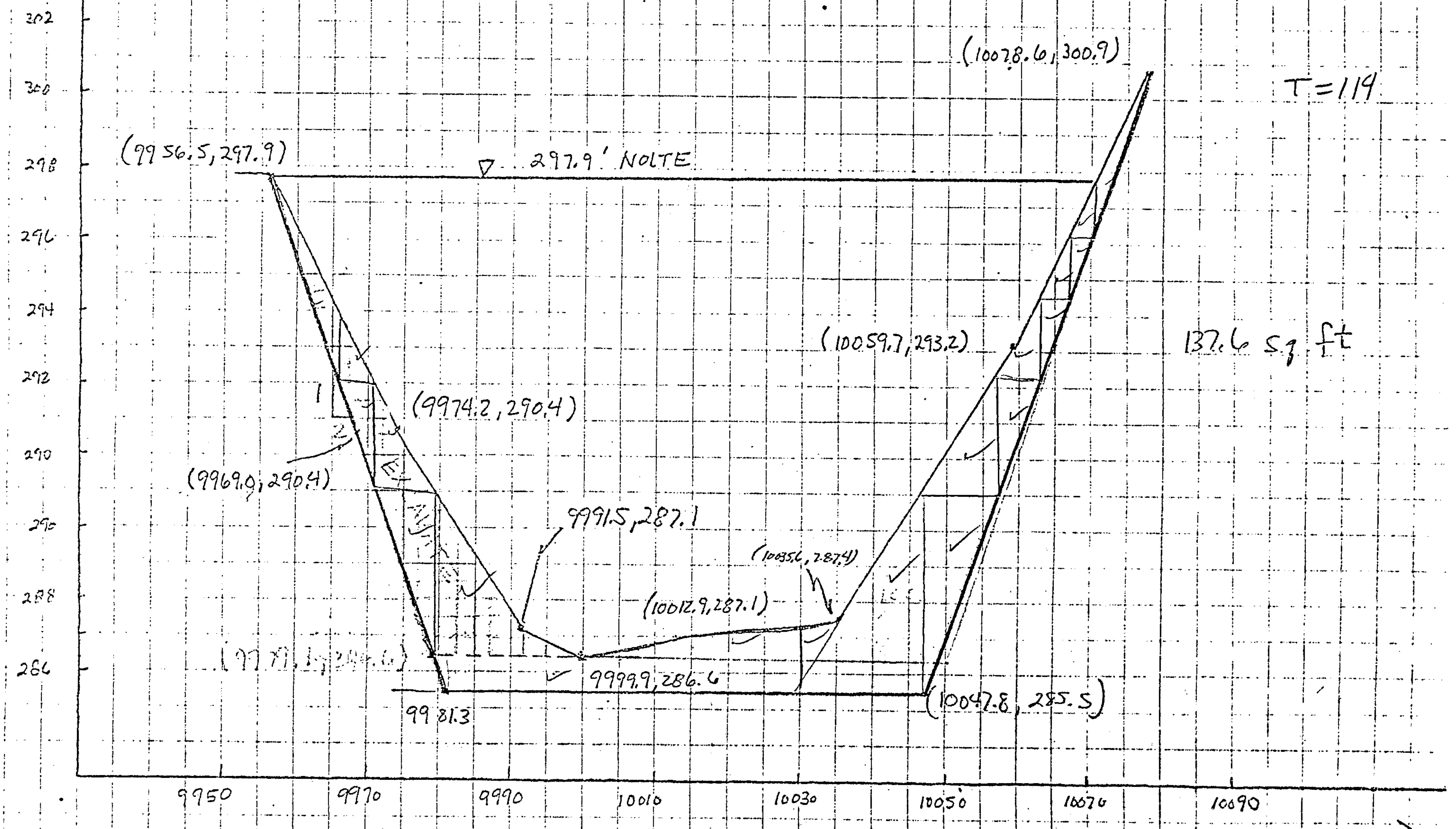
$A = \frac{Q}{V} = \frac{600}{7.10} = 85 ft^2$

Excav = 236 s.f. /ft

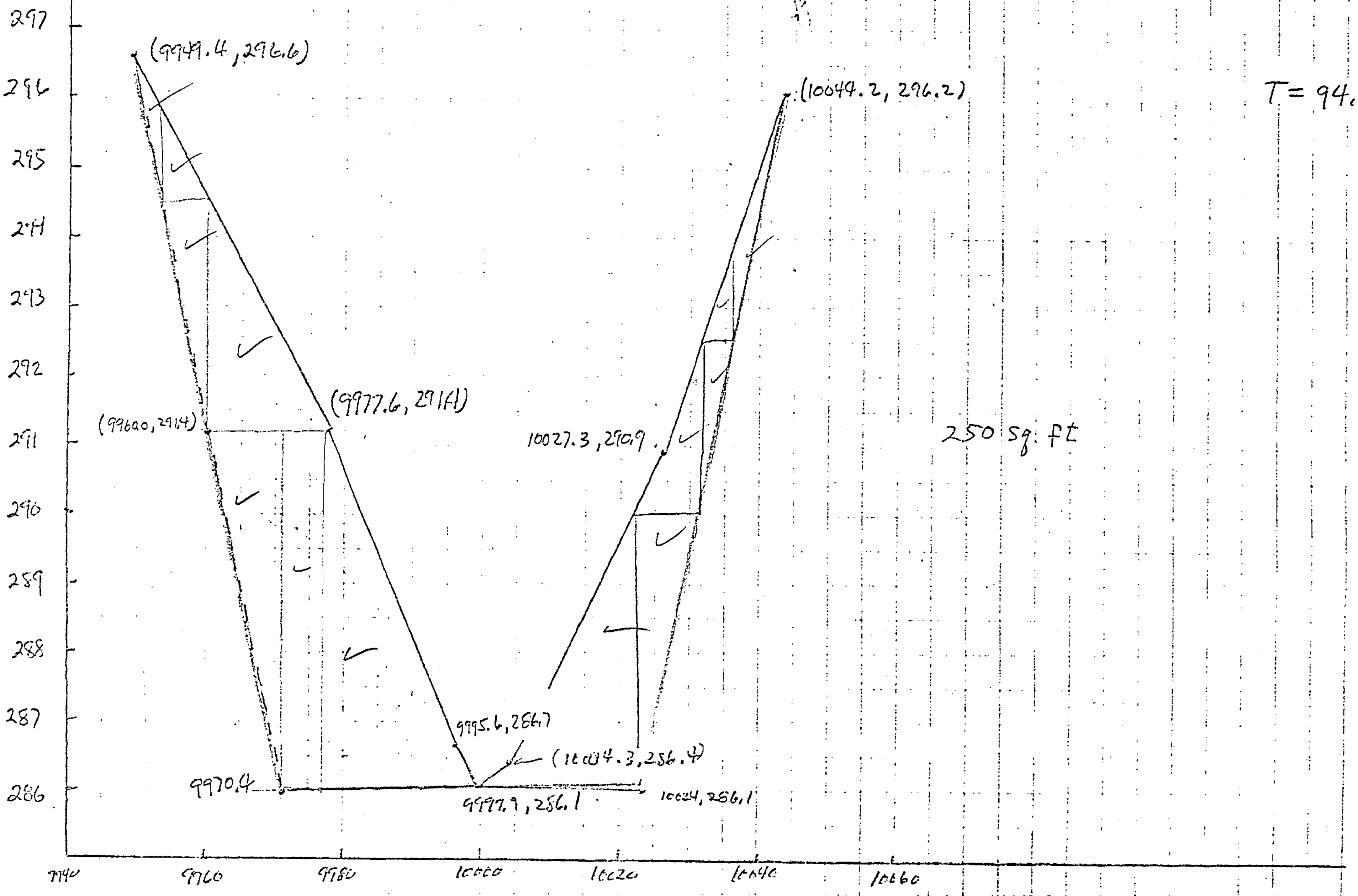
$b = 54.8$

B.K
2/23/81

XS 68720 REACH 6A



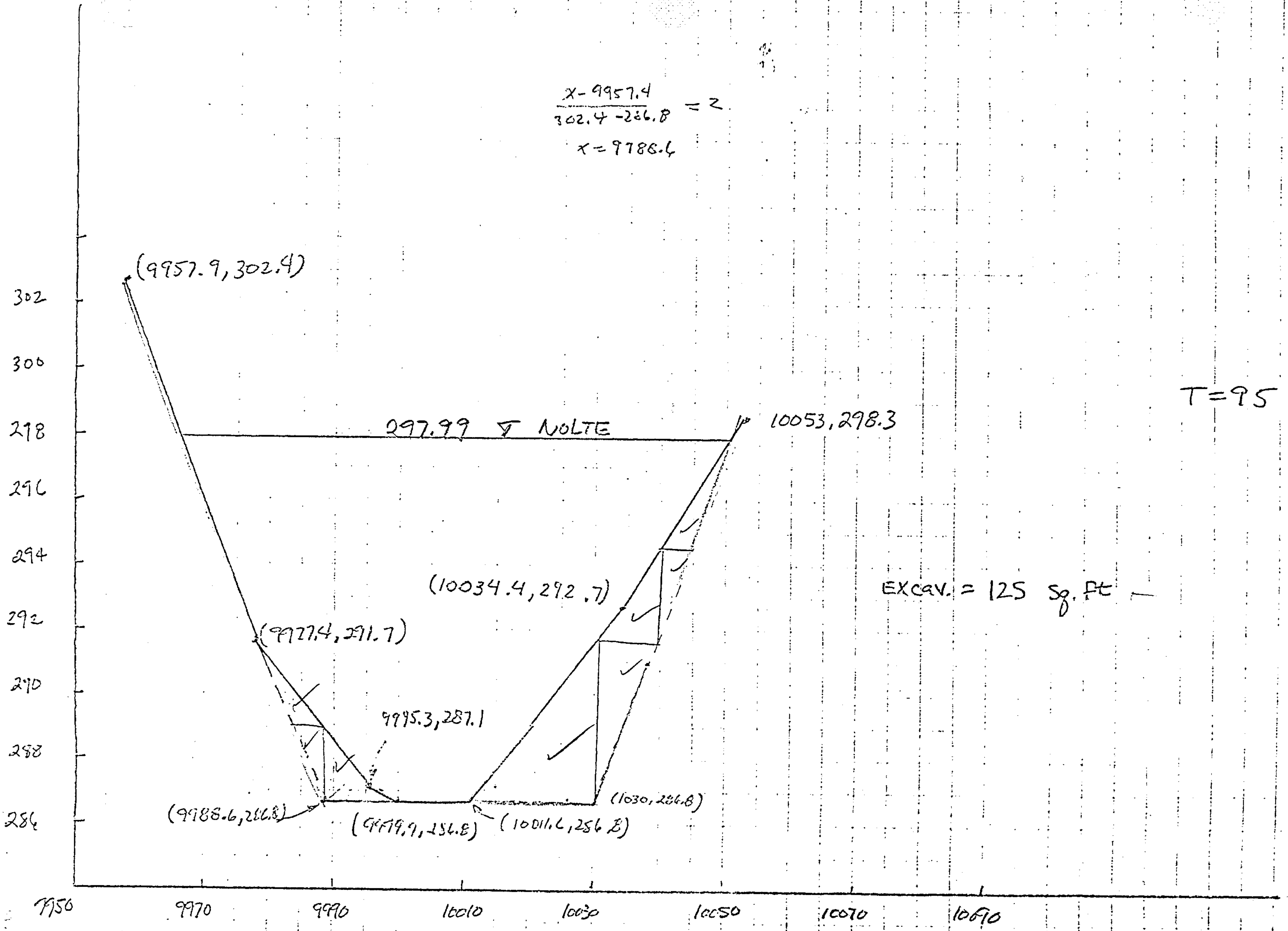
X-S 68935 Reach 6a



X-S 69185 Reach 6a

$$\frac{x-9957.4}{302.4-286.8}=2$$

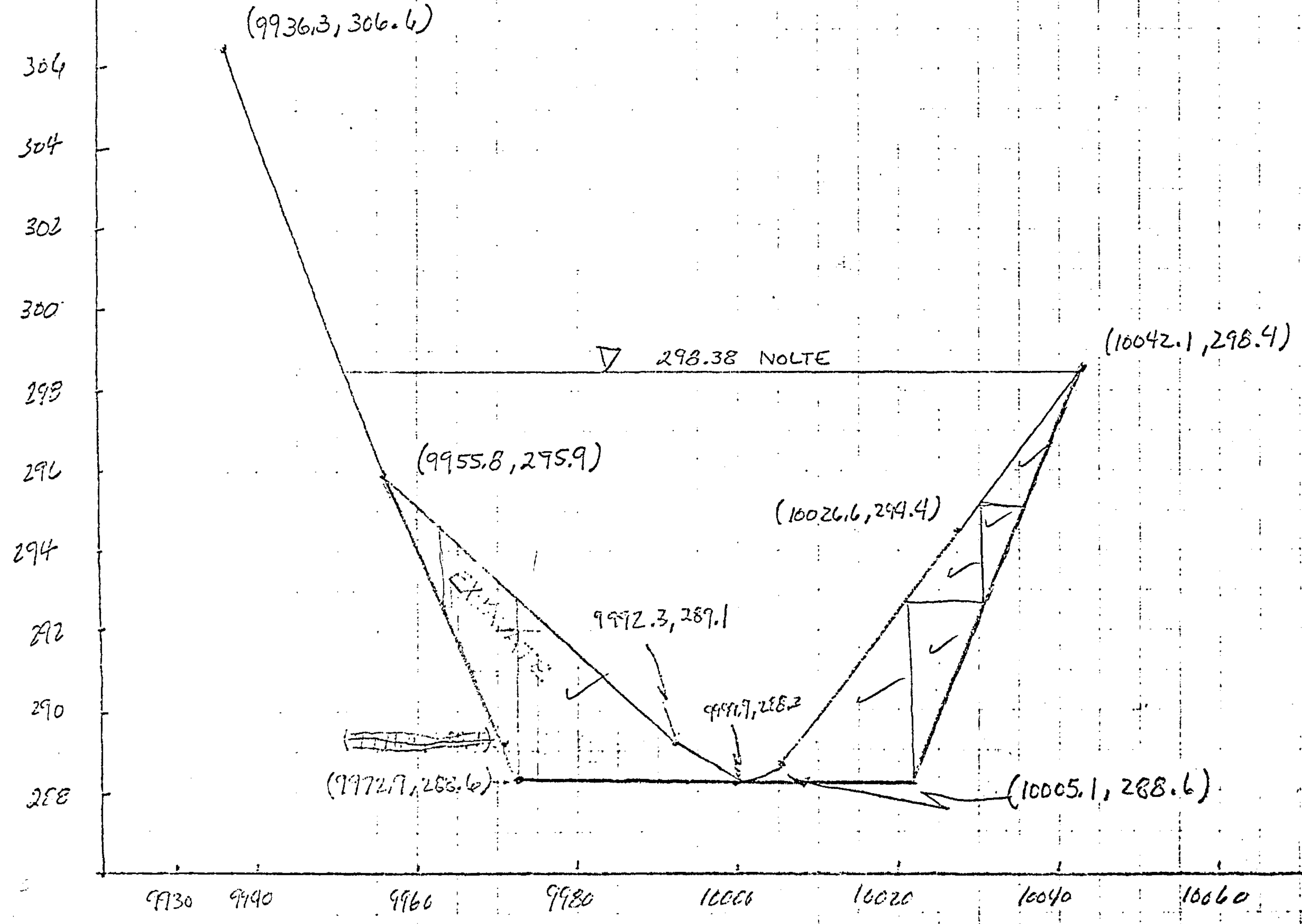
$x=9786.4$



T=95

EXCAV. = 125 Sq. Ft

REACH 6A, [illegible] 1095+10



T = 91

$$\frac{x - 9934.3}{306.6 - 288.3} = 2$$

$x = 9972.9$

197.4 S.F.

Sta 522+00 - Sta 703+00
L=18,100

BK
3/7/01
105

Reach 6A

R/W Cost Estimate: Creek Cost = $200/acre

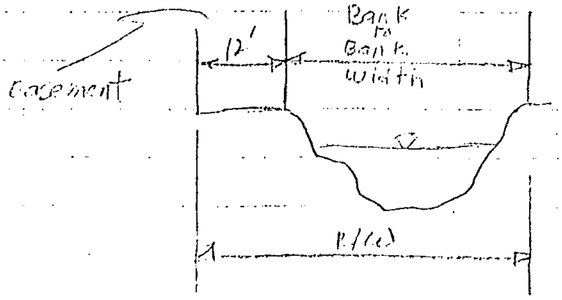
Sta	Bank to Bank Width	Length between stations	AREA (ft)
520+05	118.4	-365 7170 Sta 522+00	19,116
523+70	106.5	290	31,972
526+60	114.0	60	7,167
527+20	124.9	226	26,705
529+46	113.2	109	12,378
530+55	114.1	295	27,530
533+50	86.1	225	17,055
535+75	65.5	385	34,823
539+60	115.4	350	36,400
543+10	92.6	465	48,499
547+75	116.0	310	31,357
550+85	86.3	370	35,335
554+55	104.7	365	33,890
558+20	81.0	415	53,639
562+35	177.5	140	24,003
563+75	165.4	57	8,940
564+32	148.3	133	19,870
565+65	150.5	285	37,691
568+50	114.0	325	45,435
571+75	165.6	610	112,657
577+85	201.8	225	41,333
580+10	165.5	360	66,978
583+70	206.6	300	54,585
586+70	157.3	295	46,138
589+65	155.5	295	64,148
592+60	279.4	315	67,079
595+75	146.5	370	57,525
599+65	148.5	385	56,095
603+50	142.9	280	42,238
606+30	158.8	295	47,967
609+25	166.4	365	57,944
612+90	151.1	380	56,601
616+70	146.8	420	77,280
620+90	221.2	435	75,907
625+25	127.8	385	48,183
629+10	122.5	390	53,060
633+00	149.6		
			1,466,983 ft^2

BK
3/7/21
106

Sta	Bank to Bank width	length between stations	Area
636+77	151.0	308	40,594
3985	112.6	140	16,702
64-125	126.0	61	7,244
64186	111.5	94	10,072
64-280	102.8	380	41,591
64-660	116.1	350	35,665
65010	87.7	260	27,456
652+70	123.5	370	45,085
656+40	120.2	360	39,690
660+00	100.3	450	42,525
664+50	88.7	525	60,848
669+75	143.1	425	53,083
674+00	106.7	360	38,970
677+60	109.8	460	50,002
682+20	107.6	385	42,158
686+35	111.4	115	13,426
687+20	122.1	44	5,326
687+64	120.0	171	18,365
89+85	94.8	250	23,738
691+85	95.1	325	32,646
695+10	105.8		

Sta 522+60 ⟶ Sta 695+10 = 2,112,174 ft^2

(add area from sta 703+00 to sta 695+10) = (790)(100.5) ⟹ total = 2,191,530 Ft^2 = $\boxed{50.3 \text{ acres}}$



$$\frac{(12)(18,100)}{43,560} = 4.98 \text{ Acres}$$

sta 625+50 to Sta 522+00 (L = 10,350)
use \$15,000/2 for easement cost
sta 703+00 to sta 625+50 (L = 7,750)
use \$20,000/2 for easement cost

BK
3/7/81

REACH 6A

Summary R/W cost

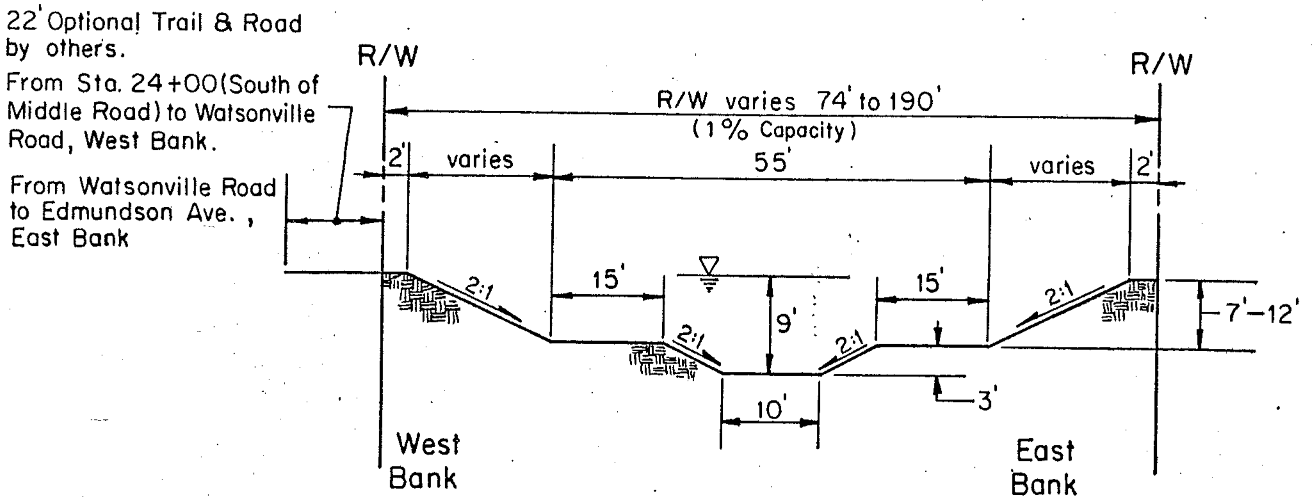
(Sta 703+00 to Sta 522+00)

Creek bottom 50.3 acres	unit cost $100/ac	Total $ 5,030 ✓
easement title From Sta 703+00 to Sta 625+50 AREA = $\frac{(7,750)(12)}{43,560}$ = 2.13 ac	unit cost $10,000/ac	$21,350 ✓
from sta 625+50 to sta 522+00 Area = $\frac{(10,350)(12)}{43,560}$ = 2.85 ac.	$7,500/ac	$21,384
	total R/W cost	$\boxed{\$47764}$

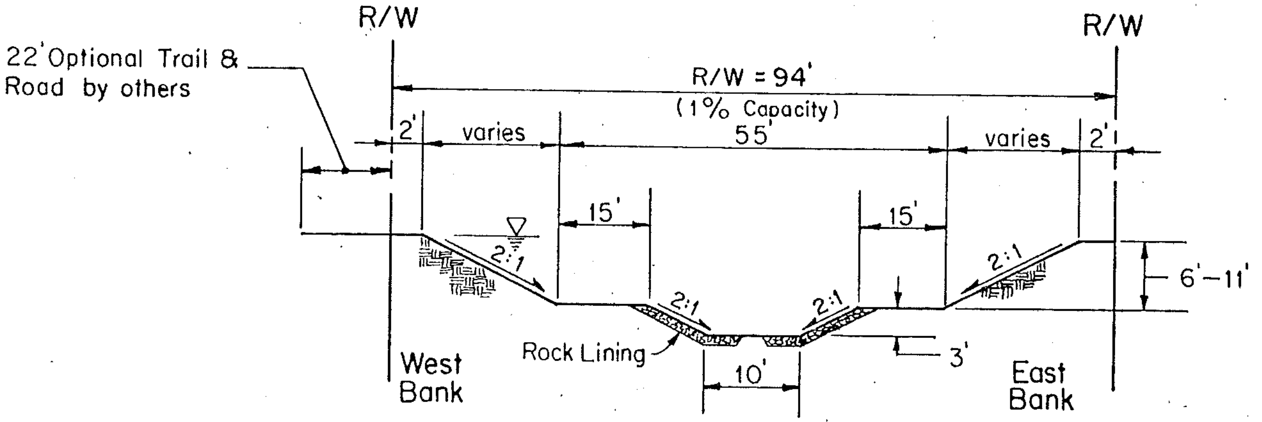
Reach 7a

This reach extends from station 11+00 to 96+40 on West Little Llagas Creek and station 11+00 to station 714+70 on Llagas Creek. The channel will be trapezoidal earth with a pilot channel. The pilot channel is needed so as to provide for maintenance roads within the channel. One drop structure is needed for stability. The channel will be sized for the 1% event. Three road culverts and one bridge are needed.

WEST LITTLE LLAGAS CREEK


22' Optional Trail & Road by others.
From Sta. 24+00 (South of Middle Road) to Watsonville Road, West Bank.
From Watsonville Road to Edmundson Ave., East Bank
R/W
R/W
R/W varies 74' to 190'
(1% Capacity)
2'
varies
55'
varies
2'
2:1
15'
9'
15'
2:1
2:1
2:1
7'–12'
3'
10'
West Bank
East Bank

STA. 24+00 (700' d/s Middle Ave.) TO STA. 96+40 (Edmundson Ave.)



STA. 11+00 (Confluence w/Main Br.) To STA. 24+00 (700' d/s Middle Ave.)

CONFLUENCE WITH MAIN BRANCH LLAGAS CR. TO EDMUNDSON AVE.

REACH 7a

FIGURE 7

LLAGAS CREEK - SUPPLEMENTAL MODIFIED WORK PLAN

ESTIMATE OF CHANNEL COSTS

REACH NO. 7A Case 7 REV. 3

Item	Quantity	Unit Cost	$
Channel Excavation	176 827	2.80	495116
Compacted Embankment			
Drop Structures	244	350	85,400
Drainage Inlets	10	4000	40,000
Riprap	7,298	40	291,920
er Stone			
Seeding			
Landscaping		1%	9181
tructural Excavation			
Rectangular Concrete Channel			
Compacted Backfill			
Levee Embankment			
Site Preparation (Levees)	16.18	350 ac	5663
Mobilization	~~6%~~ 3%		~~27,543~~ 27,818

Subtotal ~~945,642~~ 955,098

~~10~~-12 ✓

15% Contingency ~~113,477~~ 114,611

TOTAL ~~1,059,119~~ 1,069,711

Reduce landscaping and Seeding
To 1% from 3% because of
narrow right of way DDP 7/28/81

LLAGAS CREEK - SUPPLEMENTAL MODIFIED WORK PLAN

ESTIMATE OF OTHER CONSTRUCTION COSTS

REACH NO. 7A Case 7 REV 3

Item	Quantity	Unit Cost	$
State and County Bridges			
Private Bridges	700	30 S.F	21,000
RCB Culverts	~~399~~ 518	305	157,990 ~~121,695~~
Relocation of Utilities			

Subtotal 178,990 ~~142,695~~

~~15~~ 12% Contingency 21,479 ~~17,123~~

TOTAL 200469 ~~159 818~~

ESTIMATED COST OF LAND PURCHASE

Item	Quantity	Unit Cost	$
Creek Bottom			
Agricultural			
Potential Residential ~~(low value)~~	13.33 Ac	20,000	266,600
Potential Residential ~~(medium value~~)	2.85 Ac	25000	71,250
Residential/School			
Dwellings	(realig the channel		

No House will be removed)

TOTAL 337850

JM 2/2/80

113

Case 7 Revision (2)

out

		Design Flows	1% FLOOD REDUCED BY SPILL NEAR LLAGAS AVENUE
LOCATION	STATION	1% FLOOD (CASE 1) (cfs)	cfs
	227+35 - 204+00	640	
U/S WRIGHT AVE.	204+00 - 195+15	810	
U/S MAIN ST.	195+15 - 173+94	810	500
U/S 5TH ST	173+94 - 149+00	950	700
U/S SPRING ST	149+00 - 138+00	1050	800
	138+00 - 130+00	1550	1250
U/S EDMUNDSON AVE.	130+00 - 96+40	1550	1250
	96+40 - 86+40	1670	1400
U/S EDMUNDSON CR.	86+40 - 75+50	1670	1400
U/S MAIN BR.	75+50 - 11+00	2220	2000

Calif

LLH 7/22/81

Reach 7A

Upper Llagas

11+00 — 46+50
46+50 — 75+50

Aged

```
   WP PROG      1
     DATA
      2200.          Q1
         6.6         D
         55.         B
          2.         Z
     0.0014          S
      0.035          N
       RUN
        81.4         T
     450.12          A
5.325849328          R
2180.732237          Q2
4.844779696          V
 Q1/Q2 RATIO
1.008835456
         END
```

As Built

```
   WP PROG      1
     DATA
      1400.          Q1
         4.2         D
         55.         B
          2.         Z
     0.0014          S
      0.025          N
       RUN
        71.8         T
     266.28          A
3.608962832          R
1393.380216          Q2
5.232763315          V
 Q1/Q2 RATIO
1.004750882
         END
```

75+50 — 86+40
86+40 — 96+40

```
   WP PROG      1
     DATA
      1670.          Q1
          6.         D
         41.         B
          2.         Z
      0.002          S
      0.035          N
       RUN
         65.         T
       318.          A
 4.68799646          R
1691.288644          Q2
5.318517749          V
 Q1/Q2 RATIO
0.987412767
         END
```

```
   WP PROG      1
     DATA
      1075.          Q1
         4.3         D
         41.         B
          2.         Z
     0.0014          S
      0.025          N
       RUN
        58.2         T
     213.28          A
3.541081625          R
1102.005028          Q2
5.166940302          V
 Q1/Q2 RATIO
.9754946422
         END
```

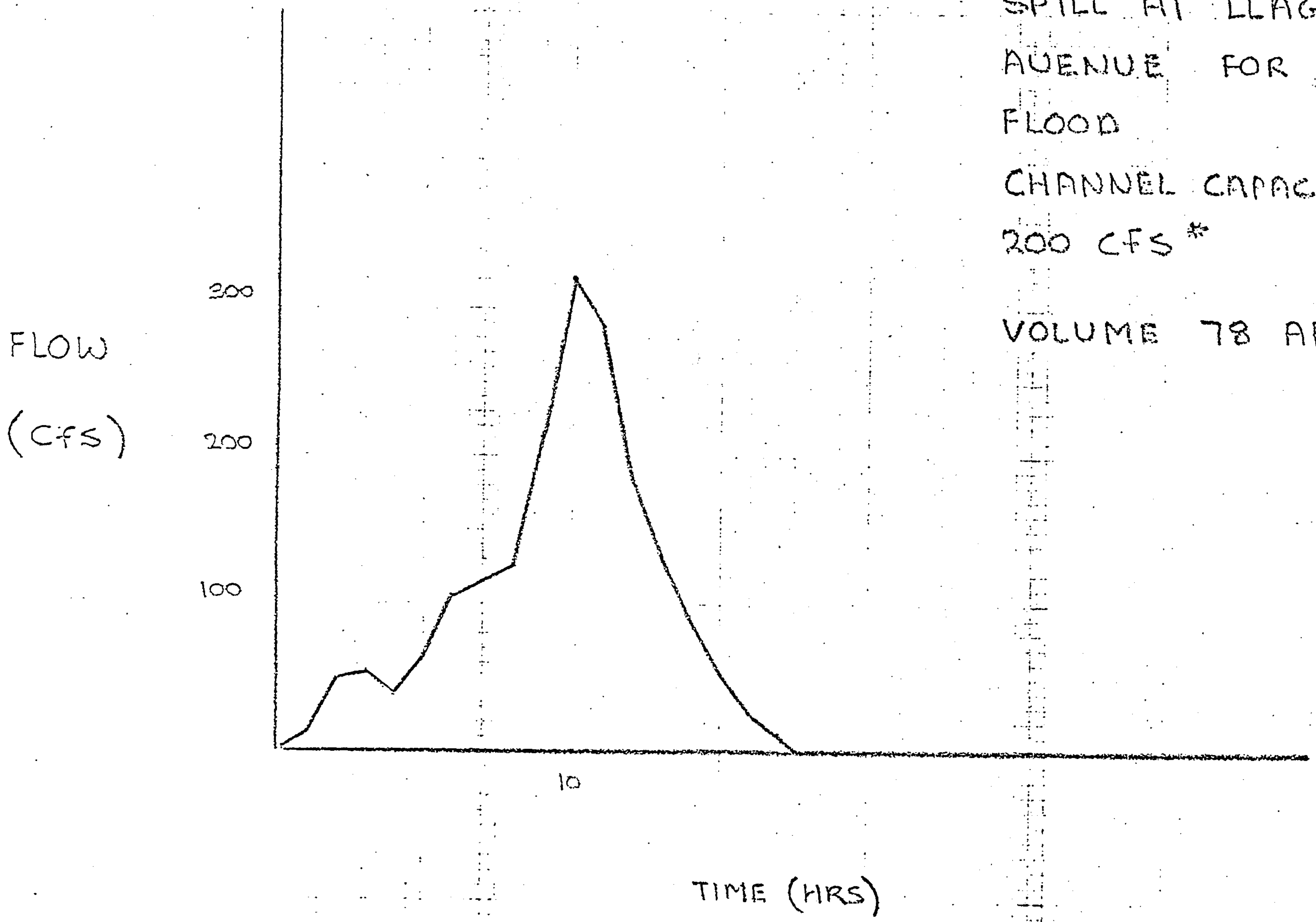
Drop Structure Sta 11+00 Q = 2200 cfs
Volume 244 cfs

JM 2/2/80

SPILL AT LLAGAS
AVENUE FOR 1%
FLOOD

CHANNEL CAPACITY
200 CFS *

VOLUME 78 AF



* FROM FIA

2/23/81
TJ

LLAGAS CREEK - Reach 7A 7B 8A

117

Case 7 Revised (2)
Assumptions

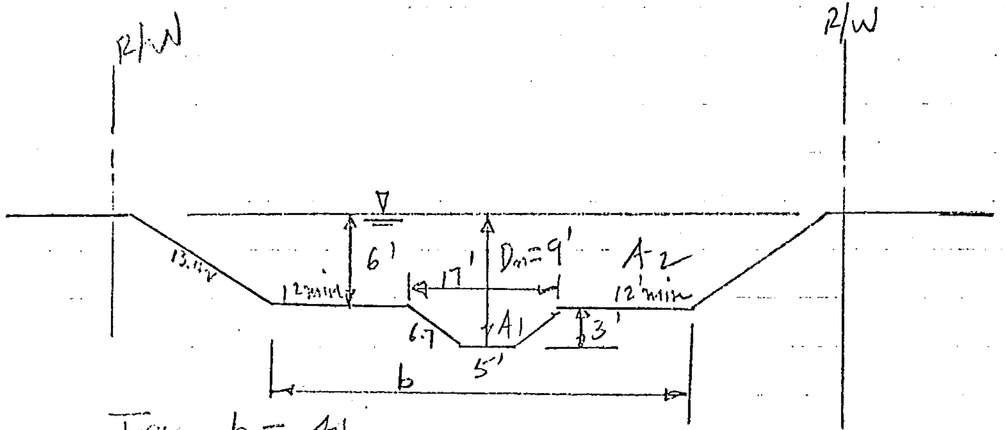
1. Channel is designed w/ Freeboard.
2. 1' freeboard for RCB
3. No fencing in Ag. Area. Fencing within the city limits
4. Design channel for 1% flood. no spill at LLAGAS Ave.
5. Delete portions of 8B
6. Low flow channel will be provided
7. Delete Maintenance Rd on top of Bank
8. Reduce unit price for Drainage inlet from $6,000/ea to $4000/ea for Reach 7A, $2500/ea for reach 8A.
9. Realign the channel to save 2 houses.
10. use $30/s.f. for Ped. Bridges.

3/1/81
Ty

LLAGAS CREEK - REACH 7A

sta 75+50 - 96+40.
$Q = 1670$ cfs.
$n = .035$
$s = .002$
$D_n = 9'$

$$AR^{2/3} = \frac{Qn}{1.486 S^{1/2}} = \frac{(1670)(.035)}{(1.486)(.002)^{1/2}} = 879.5$$



Try b = 41

$A_1 = 33$ S.F.
$A_2 = 318$ S.F.
351 S.F

$$R = \frac{A}{P} = \frac{351}{69.42} = 5.06$$

$$R^{2/3} = 2.95$$

$$AR^{2/3} = (351)(2.95) = 1035$$

use 41'

use $\boxed{D_n = 8.5}$ $\boxed{b = 41'}$

$A_2 = 286$
$A_1 = 33$
319

$$R = \frac{319}{67} = 4.76$$

$$AR^{2/3} = (2.83)(319) = 902 \cong 880$$

$$V = \frac{1670}{319} = 5.2 \text{ fps}$$

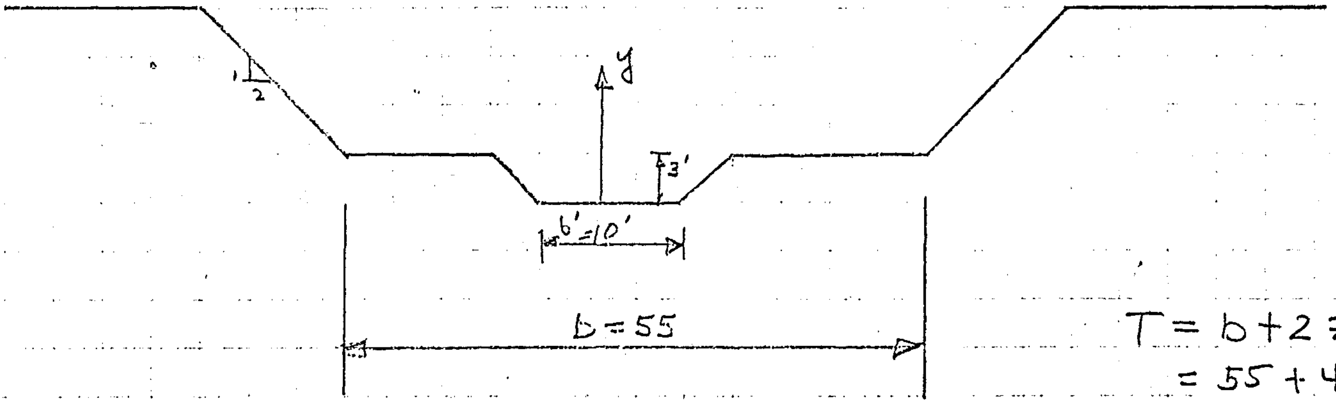
REACH 7A

Hydraulics s/a 11+00 — 75+50 :

$$\frac{Q^2}{g} = \frac{a^3}{T}$$

T = width of water surface
a = cross-sectional area

$$\frac{2200^2}{g} = \frac{a^3}{T} = 150{,}310.56$$



$$T = b + 2zd$$
$$= 55 + 4d$$

Y	A	T	a³/T
3	48	22	5,026.91
4	105	59	19,620.76
5	166	63	72,607.87
6	231	67	183,975.98
5.5	198	65	119,421.42
5.8	217.68	66.2	155,810.81
5.78	216.36	66.12	153,171.79
5.76	215.04	66.04	150,564.16

$\underline{d_c = 5.75 \text{ feet}} \longrightarrow d_n = 9.0 \text{ feet}$

control

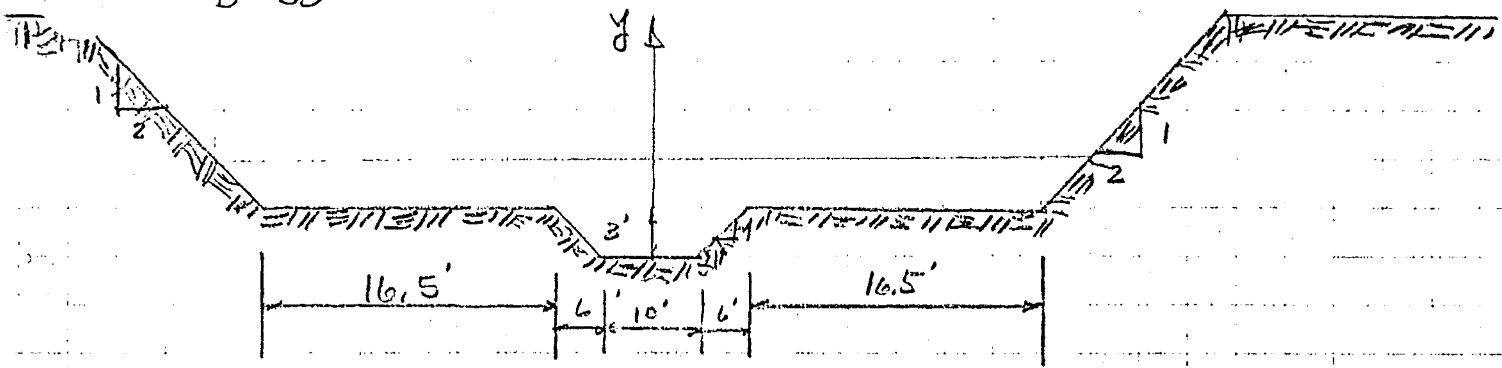
REACH 7A

B.K
2/28/81

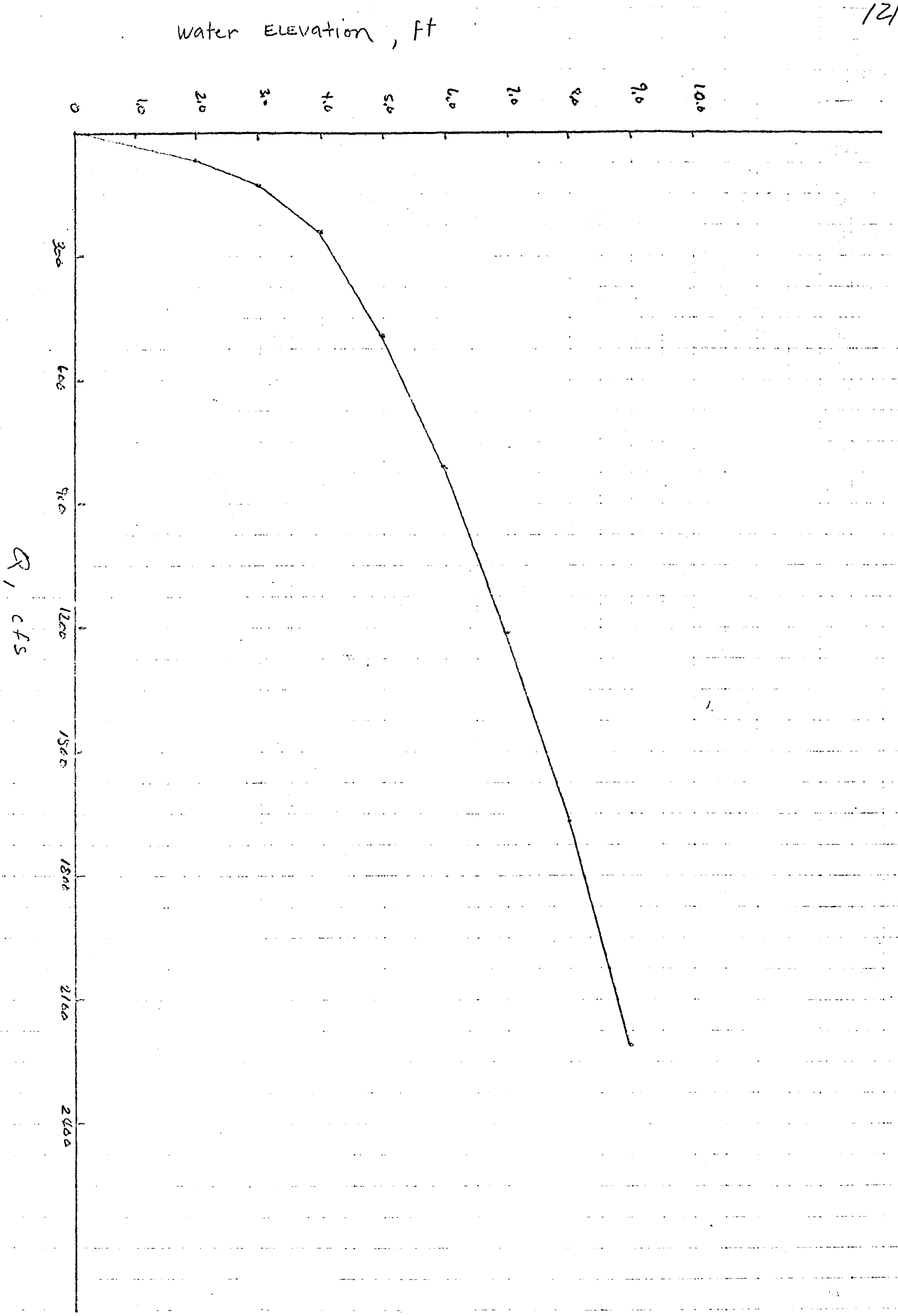
120

Q = 2200 CFS
n = 0.035
S = 0.0014
b = 55'

$C = \frac{1.486}{0.035}(0.0014)^{1/2} = 1.589$



Y	P	A	R	$AR^{2/3}$	C	Q	V
2						58.73	
3	23.42	48	2.05	77.45	1.589	123.04	2.56
4	60.89	105	1.72	151.0	1.589	240	2.29
	65.36	61 166	2.54	309.0	1.589	491.0	2.96
6	69.84	L=65 231	3.31	512.82	1.589	814.87	3.53
7	74.31	L=69 300	4.04	760.63	1.589	1,208.6	4.03
8	78.78	L=73 373	4.74	1051.73	1.569	1671	4.48
9	83.25	L=77 450	5.41	1,386	1.589	2202	4.89
10							


Water ELEVATION, ft
0
1.0
2.0
3.0
4.0
5.0
6.0
7.0
8.0
9.0
10.0
Q, cfs
300
600
900
1200
1500
1800
2100
2400

BK
2/28/81

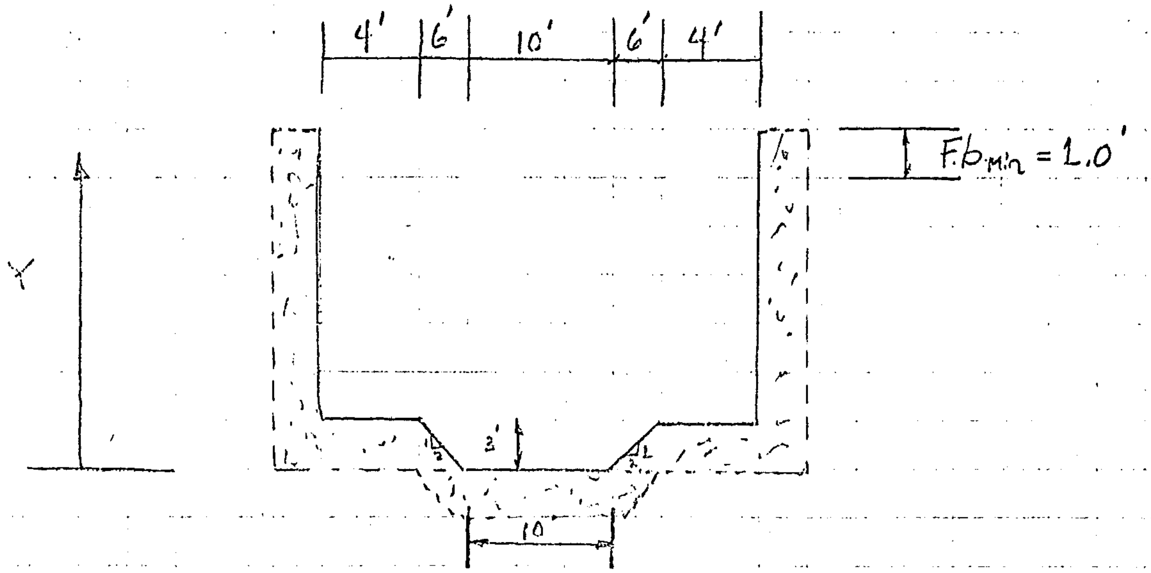
/122

REACH 7A

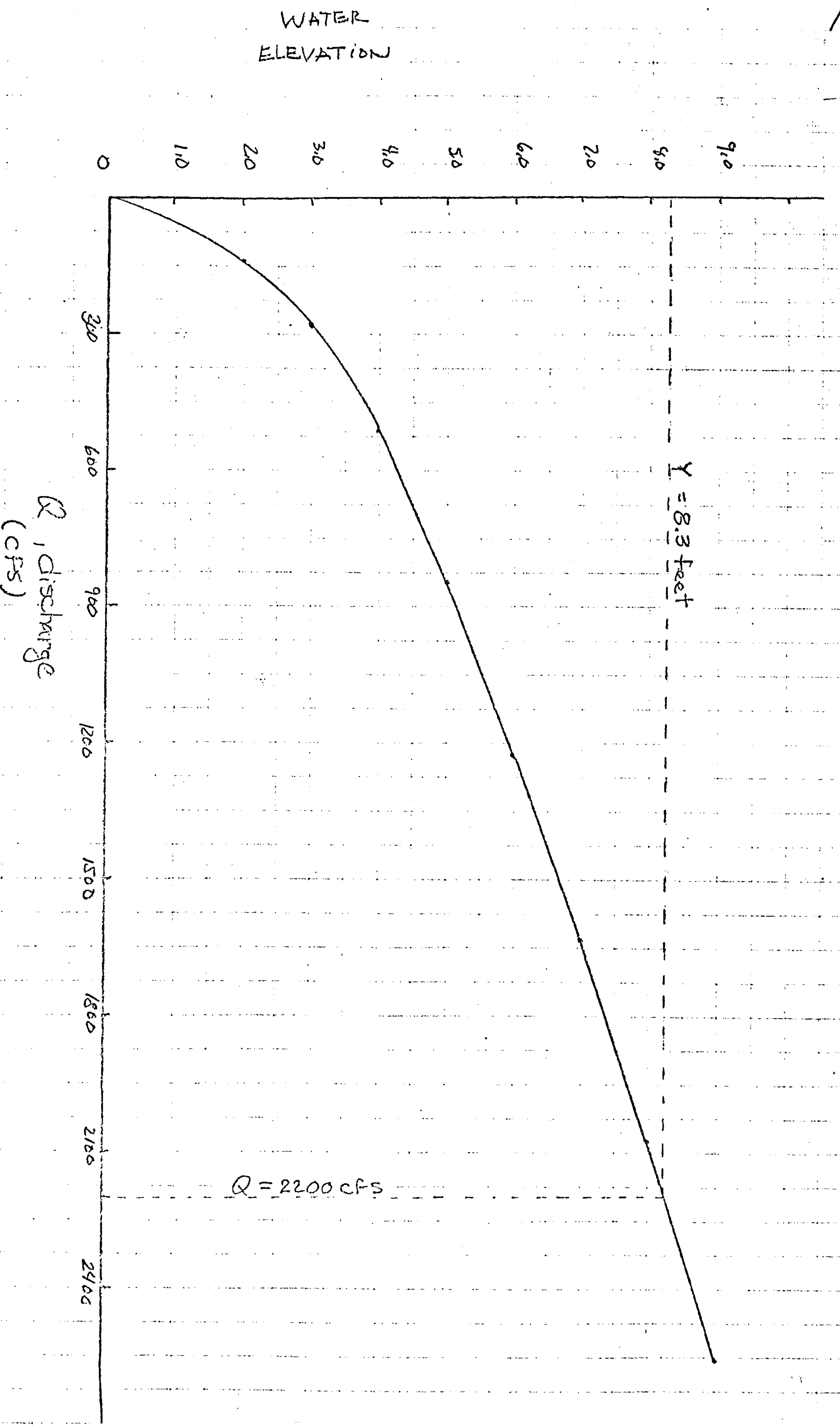
$Q = 2200$ cfs
$n = 0.015$
$S = 0.0014$

$$Q = \frac{1.486}{n} A r^{2/3} S^{1/2}$$

$$C = \frac{1.486}{0.015} S^{1/2} = 3.707$$

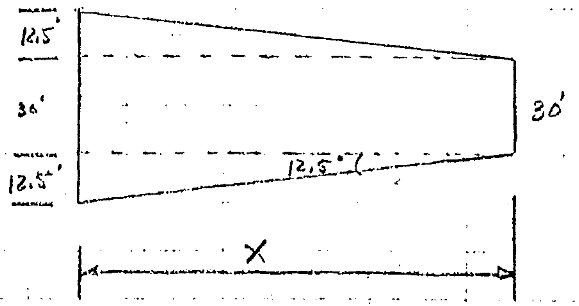


Y	P	(ft²) A	A/P R	$AR^{2/3}$	C	(CFS) Q	(FPS) V	$\frac{V^2}{2g}$	E
3'	23.42	48	2.05	77.45	3.707	287	5.98		
4'	33.42	78	2.33	137.24	3.707	509	6.53		
5	35.42	108	3.05	227.09	3.707	842	7.80		
6	37.42	138	3.69	329.40	3.707	1,221	8.85		
7	39.42	168	4.26	441.61	3.707	1,637	9.74	1.47	8.47
8	41.42	198	4.78	561.87	3.707	2,083	10.52	1.72	9.72
	43.42	228	5.25	688.81	3.707	2,553	11.20	1.95	9.95

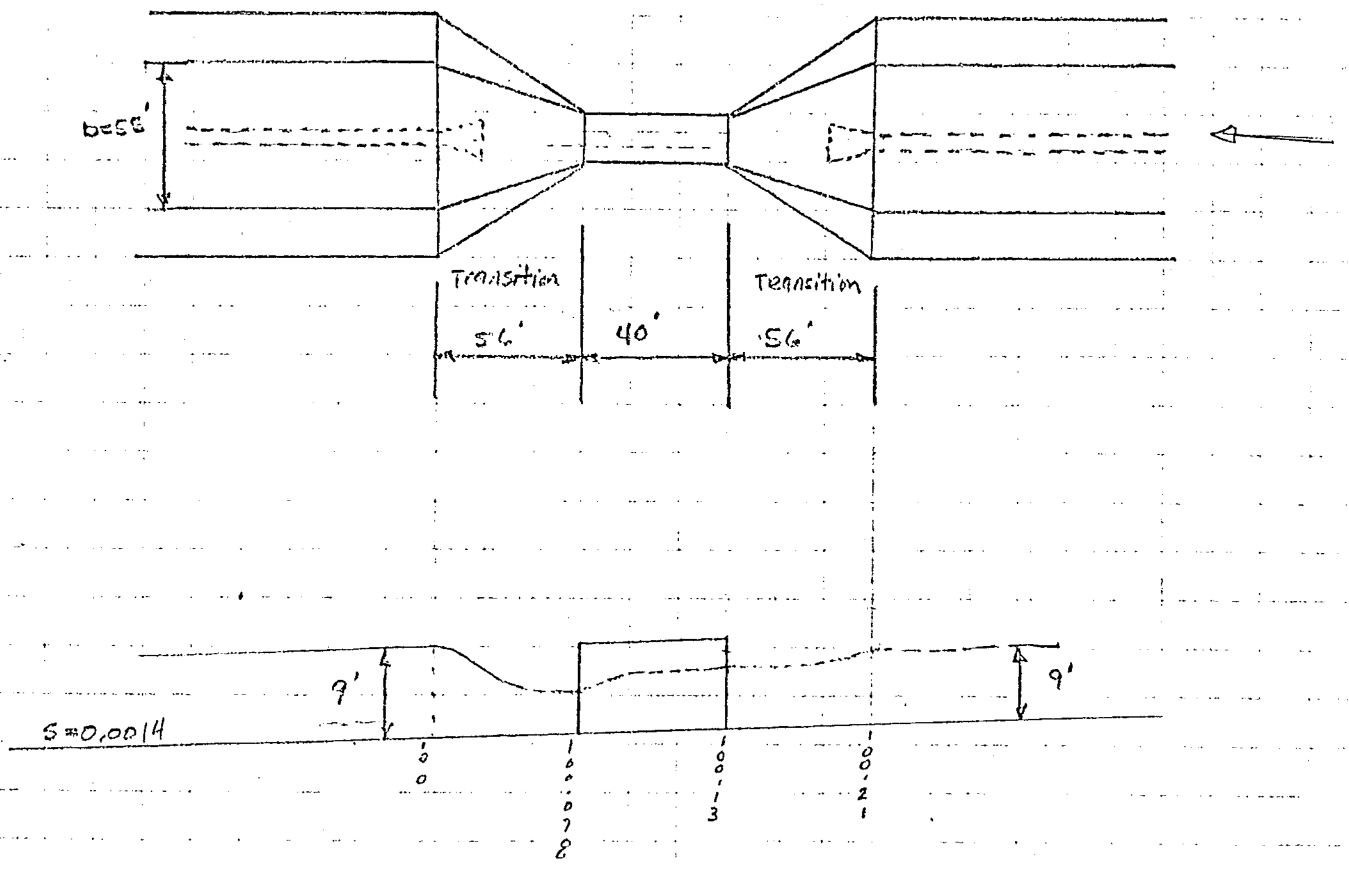

WATER
ELEVATION
0
1.0
2.0
3.0
4.0
5.0
6.0
7.0
8.0
9.0
Q, discharge
(cfs)
300
600
900
1200
1500
1800
2100
2400
Y = 8.3 feet
Q = 2200 cfs

B.K
2/28/8

Transition Length



$$x = \frac{12.5}{\tan\theta} = 56 \text{ feet}$$



$$K_c' = \frac{Q}{b^{5/2}} = \frac{2200}{36^{5/2}} = 0.2829$$

$$\frac{.14-.13}{.2971-.2656} = \frac{.14-x}{.2971-.2829}$$

$$X = 0.1355 = \frac{D_c}{b}$$

$D_c = 4.87$

$E_c = 6.03$

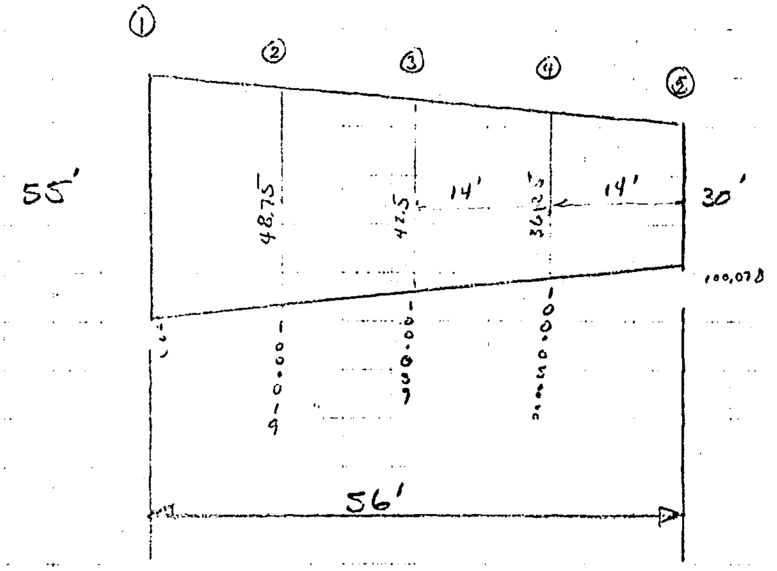
$E_n = 9.42$

B.K
2/28/81

REACH 7A

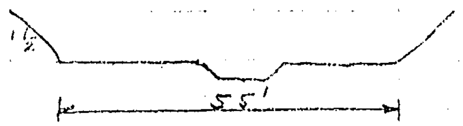
Size RCB at Edmunson & Middle st.

Transition Area

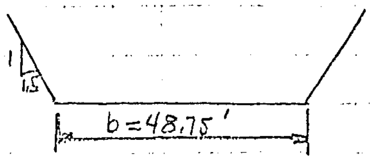


S = 0.0014
n = 0.015
Q = 2200 cfs

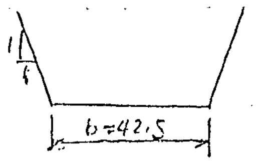
①



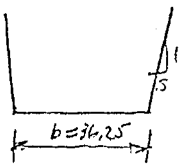
②



③



④



```
     STANDARD STEP METHOD

     PROJECT

X  I  U     B     ZR    ZL     DEL X    EL       C     Q     N     Y     YC     A       V

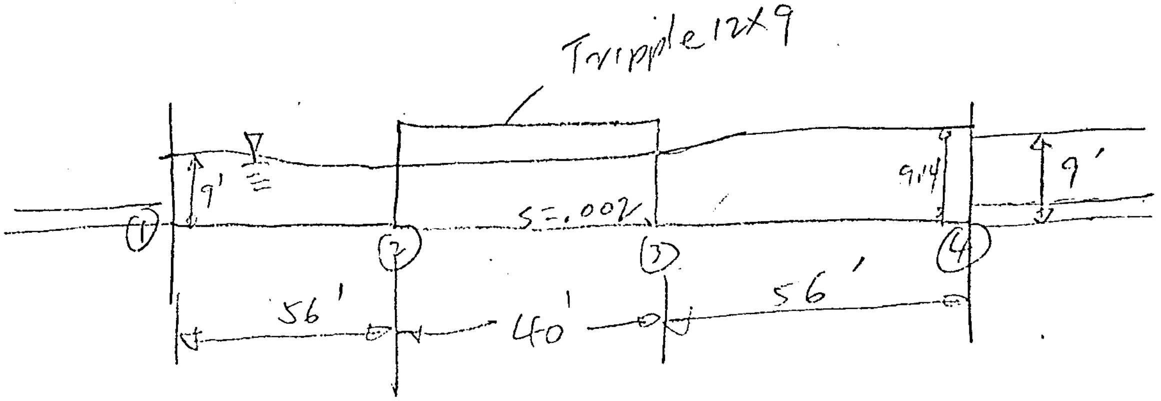
     STANDARD STEP METHOD

     PROJECT

   I  U     B     ZR    ZL     DEL X    EL       C     Q     N     Y     YC     A       V

1     1 ① 55.00 2.00 2.00       .00 100.00   .00  2200 .0149  9.00  3.51  657.00   3.34
      1   48.75 1.50 1.50     14.00 100.01   .25  2200 .0149  8.93  3.82  555.58   3.95
      1   42.50 1.00 1.00     14.00 100.03   .25  2200 .0149  8.82  4.21  453.06   4.85
      1   36.25  .50  .50     14.00 100.05   .25  2200 .0149  8.62  4.74  349.90   6.28
      1 ② 36.00  .00  .00     14.00 100.07   .25  2200 .0149  8.45  4.87  304.29   7.22
      1 ③ 36.00  .00  .00     40.00 100.13   .00  2200 .0149 [8.39] 4.87  302.39   7.27
      1 ④ 55.00 2.00 2.00     56.00 100.21   .25  2200 .0149  9.14  3.51  670.44   3.28
```

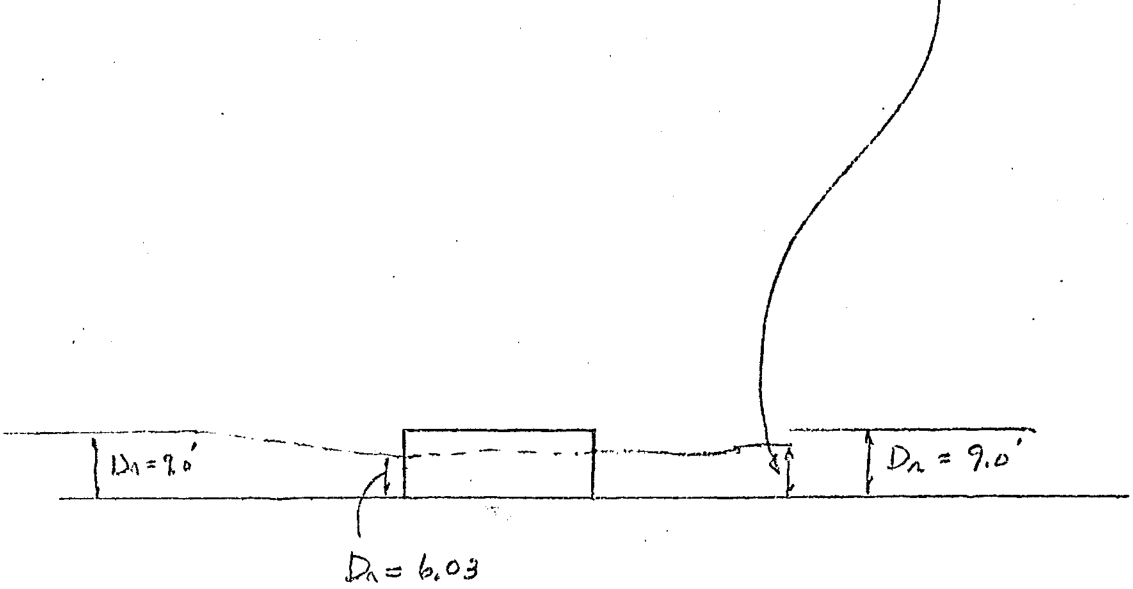
Watsonville & Middle Ave Box culvert.



use Tripple 12x9 for Edmunson
& Middle Ave

~~[illegible]~~ Dn

```
1  1  1    36.00  .00  .00      .00 100.07  .00  2200 .0149  6.03  4.87  217.08  10.13
      1    36.00  .00  .00    40.00 100.13  .00  2200 .0149  6.04  4.87  217.49  10.11
      1    55.00 2.00 2.00    56.00 100.21  .25  2200 .0149  7.66  3.51  539.26   4.07
```



$$K' = \frac{Qn}{b^{8/3} S^{1/2}} = \frac{(2200)(0.015)}{(36)^{8/3}(0.0014)^{1/2}} = 0.0624$$

$$\frac{Dn}{b} = 0.1675 \qquad Dn = 6.03'$$

Back water from the channel will be the control

LLAGAS CREEK – Reach 7A

3/1/81
y 128

R/W Req.

Sta 12+30	R/W Req 94'	use 94'	11+00 — 24+00
Sta 20+00	" " 84'		
Sta 30+00	" " 112'	use 110'	24+00 — 65+00
Sta 35+00	" " 93'		
Sta 40+00	" " 116'		
Sta 46+60	" " 114'		
Sta 50+20	" " 108'		
Sta 59+10	" " 103'		
Sta 77+00	" " 74'	use 74'	65+00 – 96+40
Sta 84+00	" " 73'		
Sta 90+00	" " 68'		
Sta 96+40	" " 70'		

11+00 – 20+40

$$94 \times 940 \times \frac{1}{43560} = 2.03 \text{ Ac.}$$

20+40 – 65+00

$$110 \times 4460 \times \frac{1}{43560} = 11.3 \text{ Ac}$$

65+00 – 96+40

$$74 \times 2100 \times \frac{1}{43560} = 3.60 \text{ Ac.}$$

$$\boxed{16.90 \text{ Ac}}$$

Excavation	A.	Dist	C.Y.
11+00	378 S.F	130'	2,561
12+30	686 S.F	770	15,172
20+00	378 S.F	1000	21,962
30+00	808 S.F	500	13,222
35+00	620 S.F	500	13,574
40+00	846 S.F	660	21,279
46+60	895 S.F	360	12,647
50+20	1002 S.F	890	31,265
59+10	895 S.F	790	19,721
67+00	453 S.F	600	13,900
73+00	798 S.F	400	9237
77+00	449 S.F		

3/1/81
Tj 129

LLAGAS CREEK — REACH 7A

Check

		700	11394
84+00	430 S.F	600	18644
90+00	348 S.F	640	18960
96+40	408 S.F.		

Total channel Exc. $\boxed{203538 \text{ C.Y}}$ ✓
Less 26711 (Exc by Developer)
$\boxed{176827 \text{ C.Y}}$ ✓

Drop structure 1 ea 244 C.Y. Ref: 1979 work Plan
Drainage inlets use $4000/ea. 10 ea. Ref: 1979 work Plan

Box Culverts min 6" freeboard.
30+70 triple 12×9 Box. Middle Ave.
59+80 triple 12×9 Box Watsonville Rd.
96+40 Triple 10×9 Box. Edmunson Ave.
80+50 " " " " La Crosse

2 × (3.5) C.Y/l.f. × 40 = 280 C.Y.
2 × 2.97 C.Y/l.f × 40 = 119238
$\boxed{\cancel{399 \text{ C.Y.}}}$ 518 cy

Private Bridges 1 ea sta 88+50 70' width 10'
use $30/S.F. for Pedestrian Bridge

70 × 10 = 700 S.F.

Ref: RCB Culvert concrete quantity is based on State Standard plans.

3/15/81

Ty

LLAGAS Creek – Reach 7A . Sta 11+00 – 96+40
(Rev 2)

Excavation

Assume excavated channel dug by the developer is Adequate. Min of excavation may be required. The Hydraulics should be checked in the final design

R/W Req.

Between sta 11+00 – 20+40 use 94' see case 7 rev 2
Between sta 20+40 – 65+00 use 110 " " "
Betwen sta 65+00 – 96+40 use 74'

11+00 – 20+40	2.03 AC.
20+40 – 65+00	11.3 AC.
65 – 96+40	

$$74' \times \left(2100 - 420 \text{ (by developer)}\right) \times \frac{1}{43560} = 2.85$$

$\boxed{16.18 \text{ AC}}$

Excavation

Total Channel Exc. 203538
Excavated by developer. −20000

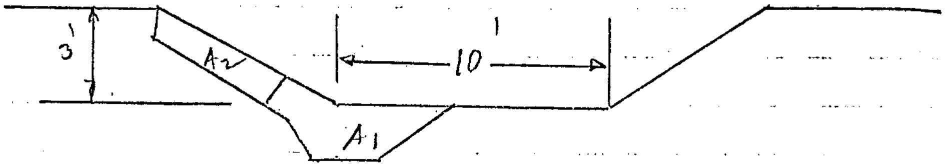
Sta 67+00 $\frac{(453 + 453)}{54}$ 400 − 6711
Total Exc. 176,827 C.Y.

cross section from Rev. R.
13.7 C.Y./L.F. × 400 = 5467 C.Y.
13.7 C.Y./L.F. × 1700 = 23290 C.Y.

∴ ±20000 C.Y. should be reasonable

LLAGAS CREEK – REACH 7A

As a result of the meeting w/ Tom Wehr we agreed that we rock lined the low flow channel side slope only.



A₁ = 19.26 S.F
A₂ = 10.05 S.F
29.31 S.F × $\frac{1}{27}$ = 1.09 C.Y/l.f.

Sta 11+50 – 46+50

3500± Less Road crossings & transition (40+56+56)
× 1.09 C.Y/l.f × 2 = 7,298 C.Y.

132
3/7/81
Ty

LLAGAS CREEK. — REACH 7B CASE 7 REV 3

R/W Cost
Sta 11+00 — 65+00

Total R/W to be Acq = 2.03 + 11.3 = $\boxed{13.33\ Ac}$ ✓
use $20,000/Ac.

Sta 65+00 — 96+40
See case 7 Rev. 2 $\boxed{2.85\ Ac}$ ✓ use $25,000/Ac.

R/W Cost for Reach 7B (Void)

~~From Edmunson Avenue to Cosmo Avenue~~

~~Sta 96+40 — 116+30~~ Net A. Crk Bottom

~~30X150X$\frac{1}{2}$ = 2250 S.F~~ ~~1575 S.F ($3)~~
~~Assume 30% creek bottom~~ .02A

~~10X13 = 130~~ ~~130 S.F ($3)~~
~~60X60 = 360~~ ~~3600 S.F ($3)~~

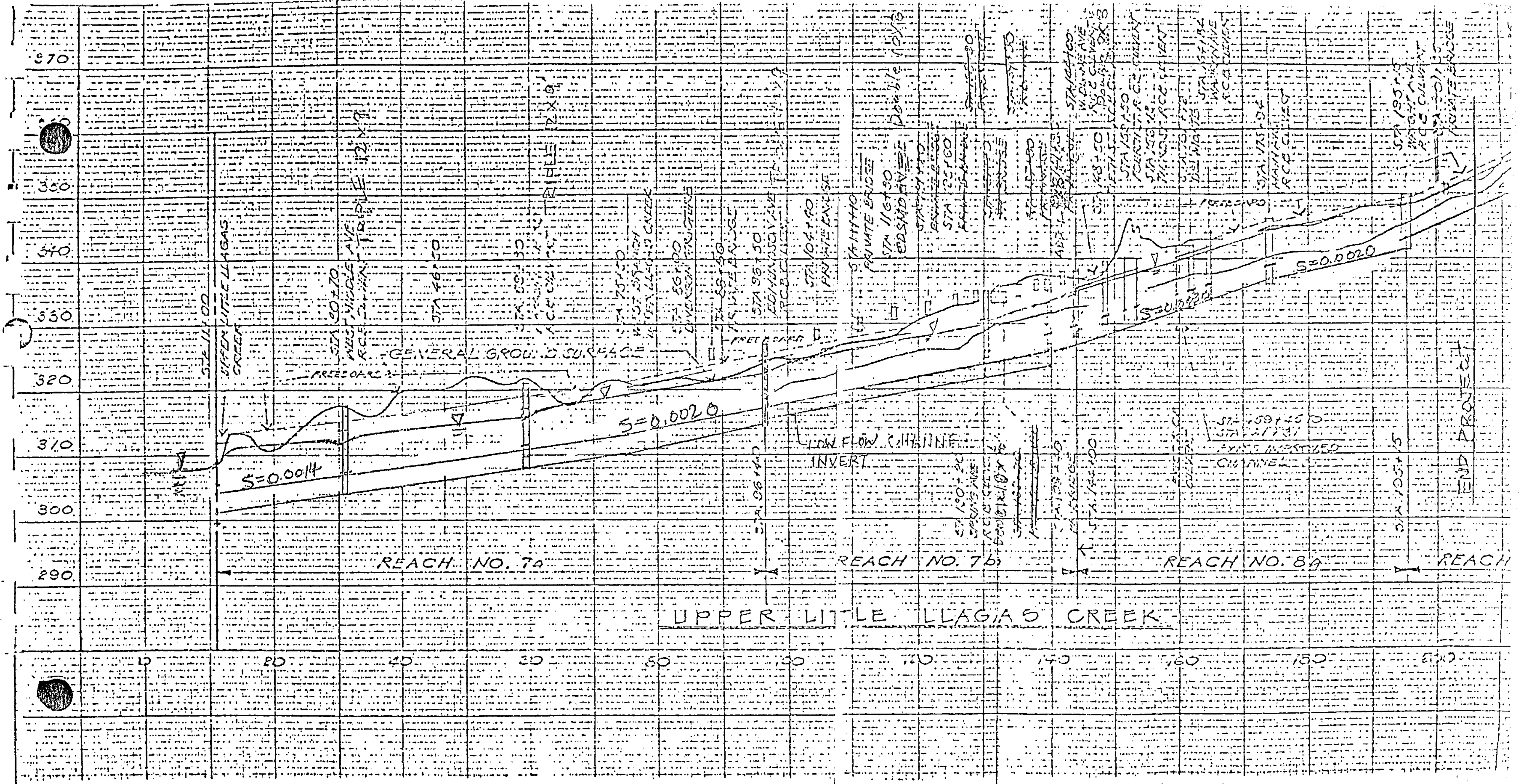
~~63 X 1,130 = 71,190 S.F~~
~~Less Crk 14238 (20%~~ .33A
~~55952~~ ~~55952 ($3)~~
~~50X130 = 6500~~ ~~6500 ($4)~~
~~20X430 = 8600 S.F.~~ ~~8600 ($4)~~
~~Crk Bottom 60X430 = 25800 S.F X$\frac{1}{43560}$~~ 0.61

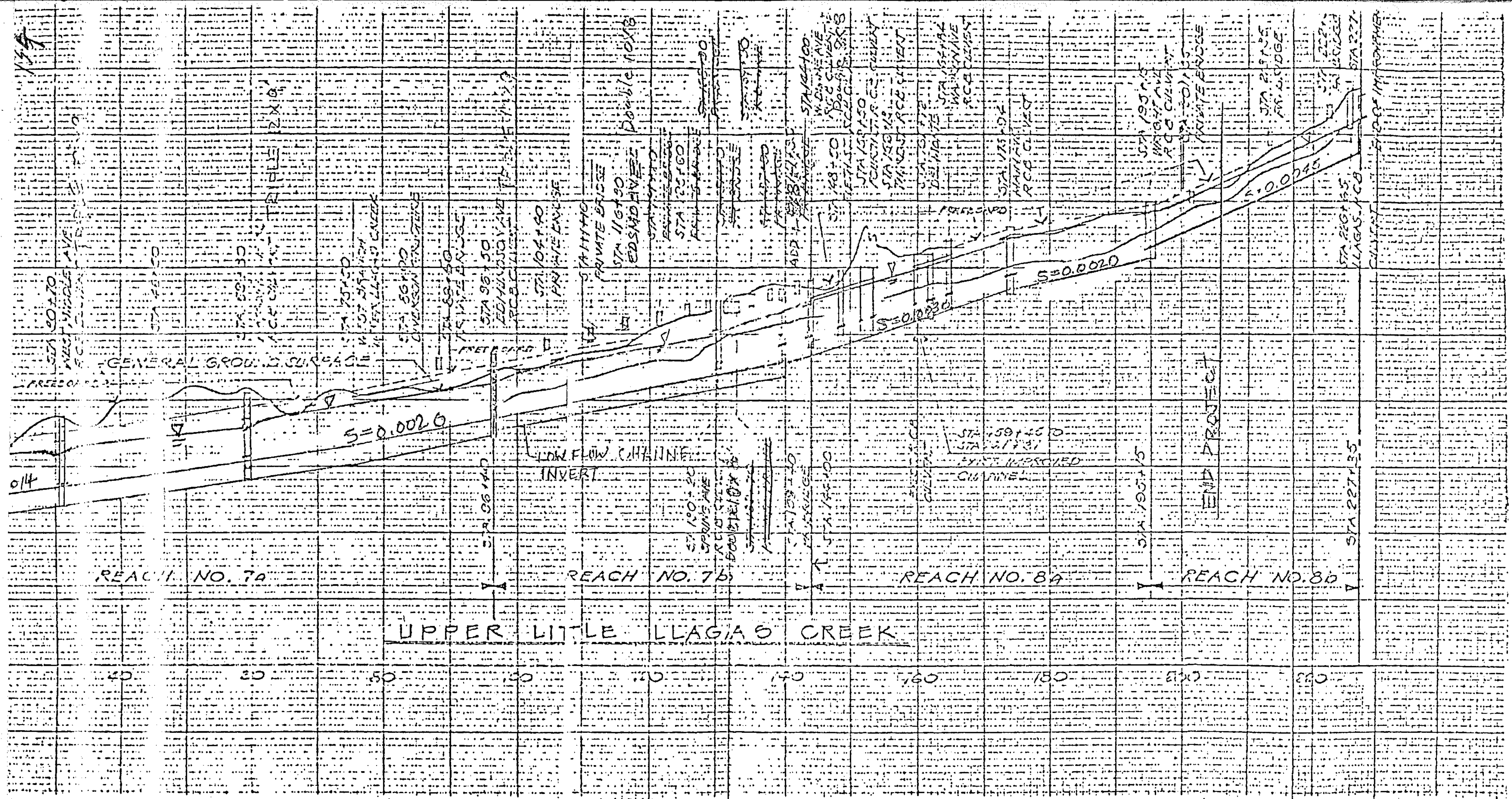
~~15X450 = 6750~~ ~~6750 ($6)~~
~~230X50 = 11500~~ ~~11500 ($6)~~
~~750X20X$\frac{1}{4356}$ = 0.34 Ac~~ 0.34

1.3A

~~61257 S.F X 3 = $183771~~
~~15100 S.F X 4 = 60400~~
~~18250 S.F X 6 = 109500~~
~~$353671~~

~~Crk Bottom 1.3 X 100 = $160~~


370
360
350
340
330
320
310
300
290
STA 11+00
UPPER LITTLE LLAGAS CREEK
STA 30+70
WEST MIDDLE AVE
RCB CULVERT TRIPLE 12X9
STA 46+50
STA 60+30
RCB CULVERT TRIPLE 12X9
STA 75+00
WEST BRANCH
LITTLE LLAGAS CREEK
STA 86+00
DIVERSION STRUCTURE
STA 88+50
PRIVATE BRIDGE
STA 95+50
EDMUNDSON AVE
RCB CULVERT
STA 104+70
PRIVATE BRIDGE
STA 111+40
PRIVATE BRIDGE
STA 116+50
EDSMID AVE
Double 10X10
STA 121+60
STA 143+00
STA 148+00
W. DUNNE AVE
RCB CULVERT
Double 9X8
STA 151+50
STA 159+12
STA 173+04
RCB CULVERT
STA 195+15
RCB CULVERT
PRIVATE BRIDGE
GENERAL GROUND SURFACE
FREEBOARD
S=0.0014
S=0.0020
S=0.0020
S=0.0020
LOW FLOW CHANNEL
INVERT
STA 96+40
STA 120+20
STA 159+50
STA 171+31
EXIST IMPROVED CHANNEL
STA 193+15
END PROJECT
REACH NO. 7a
REACH NO. 7b
REACH NO. 8A
REACH
UPPER LITTLE LLAGAS CREEK
0
20
40
30
50
60
70
140
160
180
200



1981 APR 20 PM 2:30

LLAGAS CREE

WORK PLAN

REVISED PROFILE

REACH No. 7a,7b,8a & 8b

```
*************************************************              THIS RUN EXECUTED  4/21/81  15:28
  HEC2 RELEASE DATED NOV 76 UPDATED JULY1979
  ERROR CORR -  01,02,03
  MODIFICATION -  50,51,52
*************************************************

NOTE- ASTERISK (*) AT LEFT OF CROSS-SECTION NUMBER INDICATES MESSAGE IN SUMMARY OF ERRORS LIST

REACH 7A CULVERT CHECK A

SUMMARY PRINTOUT

      SECNO        Q        QCH      CWSEL     DEPTH     CRIWS    K*XNCH      VCH      XLCH       EG     ELMIN

   6500.000   1670.00   1670.00    317.50     8.50      0.00     35.00      4.83      0.00    317.86    309.00
   6600.000   1670.00   1670.00    317.64     8.44      0.00     35.00      4.88    100.00    318.01    309.20
   6700.000   1670.00   1670.00    317.78     8.38      0.00     35.00      4.93    100.00    318.16    309.40
   6800.000   1670.00   1670.00    317.93     8.33      0.00     35.00      4.98    100.00    318.32    309.60
   6900.000   1670.00   1670.00    318.09     8.29      0.00     35.00      5.02    100.00    318.48    309.80
   7000.000   1670.00   1670.00    318.24     8.24      0.00     35.00      5.06    100.00    318.64    310.00
   7100.000   1670.00   1670.00    318.41     8.21      0.00     35.00      5.10    100.00    318.81    310.20
   7200.000   1670.00   1670.00    318.57     8.17      0.00     35.00      5.13    100.00    318.98    310.40
   7300.000   1670.00   1670.00    318.74     8.14      0.00     35.00      5.16    100.00    319.15    310.60
   7400.000   1670.00   1670.00    318.91     8.11      0.00     35.00      5.19    100.00    319.33    310.80
   7500.000   1670.00   1670.00    319.09     8.09      0.00     35.00      5.21    100.00    319.51    311.00
   7600.000   1670.00   1670.00    319.26     8.06      0.00     35.00      5.24    100.00    319.69    311.20
   7700.000   1670.00   1670.00    319.44     8.04      0.00     35.00      5.26    100.00    319.87    311.40
   7800.000   1670.00   1670.00    319.62     8.02      0.00     35.00      5.28    100.00    320.06    311.60
   7900.000   1670.00   1670.00    319.81     8.01      0.00     35.00      5.29    100.00    320.24    311.80
   8000.000   1670.00   1670.00    319.99     7.99      0.00     35.00      5.31    100.00    320.43    312.00
   8100.000   1670.00   1670.00    320.18     7.98      0.00     35.00      5.32    100.00    320.62    312.20
   8200.000   1670.00   1670.00    320.37     7.97      0.00     35.00      5.33    100.00    320.81    312.40
   8300.000   1670.00   1670.00    320.56     7.96      0.00     35.00      5.34    100.00    321.00    312.60
   8400.000   1670.00   1670.00    320.75     7.95      0.00     35.00      5.35    100.00    321.20    312.80
```

```
    SECNO         Q          QCH        CWSEL       DEPTH        S       K*XNCH       VCH        XLCH         EG        ELMIN
   8500.000    1670,00    1670,00     320,94       7,94       0,00      35,00       5,36      100,00      321,39      313,00
   8600.000    1670,00    1670,00     321,14       7,94       0,00      35,00       5,37      100,00      321,58      313,20
   8700.000    1670,00    1670,00     321,33       7,93       0,00      35,00       5,37      100,00      321,78      313,40
   8800.000    1670,00    1670,00     321,53       7,93       0,00      35,00       5,38      100,00      321,98      313,60
   8900.000    1670,00    1670,00     321,72       7,92       0,00      35,00       5,38      100,00      322,17      313,80
   9000.000    1670,00    1670,00     321,92       7,92       0,00      35,00       5,39      100,00      322,37      314,00
   9100.000    1670,00    1670,00     322,11       7,91       0,00      35,00       5,39      100,00      322,57      314,20
   9200.000    1670,00    1670,00     322,31       7,91       0,00      35,00       5,39      100,00      322,76      314,40
   9300.000    1670,00    1670,00     322,51       7,91       0,00      35,00       5,40      100,00      322,96      314,60
   9400.000    1670,00    1670,00     322,71       7,91       0,00      35,00       5,40      100,00      323,16      314,80
   9500.000    1670,00    1670,00     322,90       7,90       0,00      35,00       5,40      100,00      323,36      315,00
   9595.000    1670,00    1670,00     322,95       7,76       0,00      15,00       5,55       95,00      323,43      315,19
   9601.000    1670,00    1670,00     323,19       7,99       0,00      15,00       4,16        6,00      323,46      315,20
   9607.000    1670,00    1670,00     323,11       7,90       0,00      15,00       4,87        6,00      323,48      315,21
   9613.000    1670,00    1670,00     322,97       7,74       0,00      15,00       5,89        6,00      323,51      315,23
   9620.000    1670,00    1670,00     322,72       7,48       0,00      15,00       7,44        7,00      323,58      315,24
   9660.000    1670,00    1670,00     322,77       7,45       0,00      15,00       7,48       40,00      323,64      315,32
   9663.000    1550,00    1550,00     323,11       7,78       0,00      35,00       6,04        3,00      323,67      315,33
   9700.000    1550,00    1550,00     323,20       7,80       0,00      35,00       6,02       37,00      323,77      315,40
   9800.000    1550,00    1550,00     323,47       7,86       0,00      35,00       5,95      100,00      324,02      315,60
   9900.000    1550,00    1550,00     323,72       7,92       0,00      35,00       5,89      100,00      324,26      315,80
  10000.000    1550,00    1550,00     323,97       7,96       0,00      35,00       5,84      100,00      324,50      316,00
  10100.000    1550,00    1550,00     324,20       8,00       0,00      35,00       5,80      100,00      324,73      316,20
  10200.000    1550,00    1550,00     324,43       8,03       0,00      35,00       5,76      100,00      324,95      316,40
  10300.000    1550,00    1550,00     324,66       8,06       0,00      35,00       5,74      100,00      325,17      316,60
  10400.000    1550,00    1550,00     324,88       8,08       0,00      35,00       5,71      100,00      325,39      316,80


 SUMMARY OF ERRORS
```

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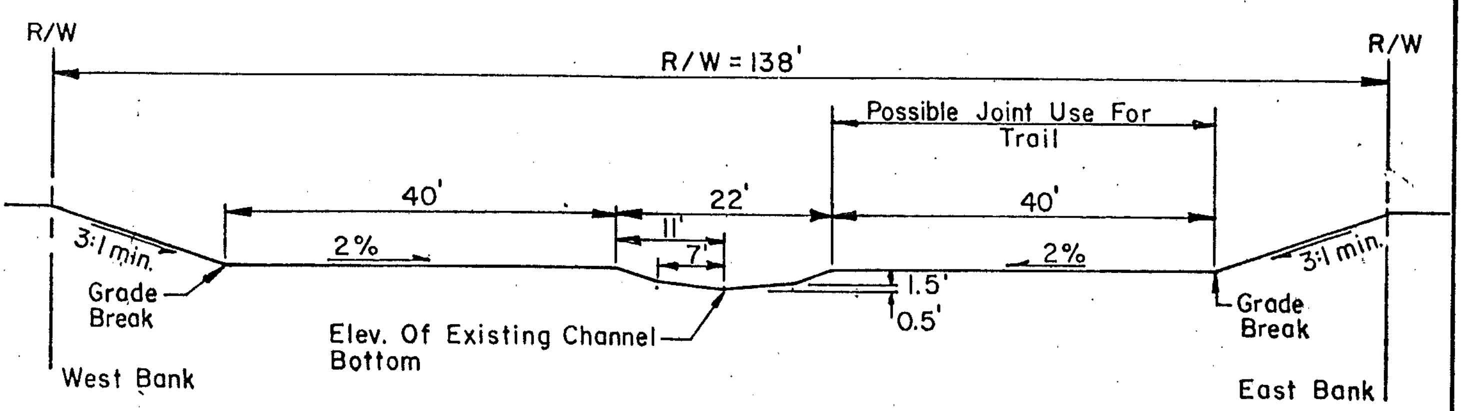
Reach 7b

This reach extends from station 96+40 to 144+00 on West Little Llagas Creek. This is a new channel. The channel will be trapezoidal earth with a pilot channel. The pilot channel is needed to provide for maintenance roads within the channel. Three culverts and three bridges are required. The channel will have a 1% event capacity.

WEST LITTLE LLAGAS CREEK

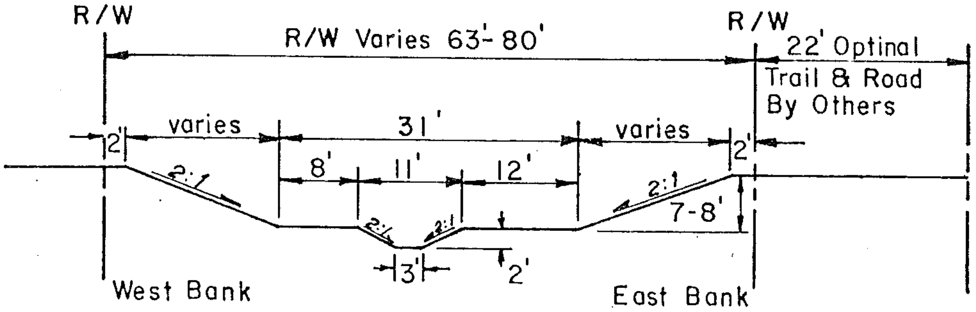


INTERIM CHANNEL

Note: Interim Channel Is To Be Constructed By Developers If Development Occurs Prior To Start Of PL-566 Project.

STA 138+00(600' d/s Dunne Ave) To STA 144+00(Dunne Avenue)

Add One 5'x8' Cell To Existing Box Culvert



STA 96+40(Edmundson Ave) To STA 138+00(600' d/s Dunne Ave.)

EDMUNDSON AVE. TO DUNNE AVE.

(1% Capacity)

REACH 7b

FIGURE 8

LLAGAS CREEK - SUPPLEMENTAL MODIFIED WORK PLAN

ESTIMATE OF CHANNEL COSTS

REACH NO. 7B case 7 REV 3

Item	Quantity	Unit Cost	$
Channel Excavation	16752	2.80	46906
Compacted Embankment			
Drop Structures			
Drainage Inlets	5	4000	20000
Riprap	168	40	6720
er Stone			
Seeding			
Landscaping		1%	747
Structural Excavation			
Rectangular Concrete Channel			
Compacted Backfill			
Levee Embankment			
Site Preparation (Levees)	3.1	350	1085
Mobilization		3 to 7.	~~2241~~ 2264

Subtotal ~~76,952~~ 77,722

~~10~~ 12
15% Contingency ~~9,234~~ 9327

TOTAL ~~86,186~~ 87,048

Reduce landscaping from 3% to 1%
due to reduced right of way 7/20/81

LLAGAS CREEK - SUPPLEMENTAL MODIFIED WORK PLAN

ESTIMATE OF OTHER CONSTRUCTION COSTS

REACH NO. 713 case7 REV 3

Item	Quantity	Unit Cost	$
State and County Bridges			
Private Bridges	~~1340~~ 2010	30	~~40200~~ 60300
RCB Culverts	316	305	96380
Relocation of Utilities	700lf	6	4200

Subtotal	~~140,780~~ 160,880
15% Contingency	~~16894~~ 19306
TOTAL	~~157,674~~ 180,186

ESTIMATED COST OF LAND PURCHASE

Item	Quantity	Unit Cost	$
Creek Bottom	1.26	100	126
Agricultural			
Potential Residential (low value)			
Potential Residential (medium value)	~~25~~ 2.17 See Cal	*	353,671
Residential/School			
Dwellings	1	50,000	50,000

TOTAL	403,797

* Cost varies from $3-6/ft²
see backup

Calif

Upper Llagas

L L Hansen 7/22/81

Reach 7B

Aged

As Built

96+40 — 130+20

```
  WP PROG     1
     DATA
      1550.        Q1
        6.5         D
        31.         B
         2.         Z
      0.002         S
      0.035         N
      RUN
        57.         T
       286.         A
4.761200514         R
1536.889973        Q2
5.373741165         V
  Q1/Q2 RATIO
1.008530231
      END
```

```
  WP PROG     1
     DATA
      1000.        Q1
        4.2         D
        31.         B
         2.         Z
      0.002         S
      0.025         N
      RUN
       47.8         T
     165.48         A
 3.32402821         R
979.7511412        Q2
 5.92066196         V
  Q1/Q2 RATIO
1.020667349
      END
```

130+20 — 144+00

```
  WP PROG     1
     DATA
      1050.        Q1
        5.3         D
        31.         B
         2.         Z
      0.002         S
      0.035         N
      RUN
       52.2         T
     220.48         A
 4.03054199         R
1060.255653        Q2
4.808851835         V
  Q1/Q2 RATIO
0.990327189
      END
```

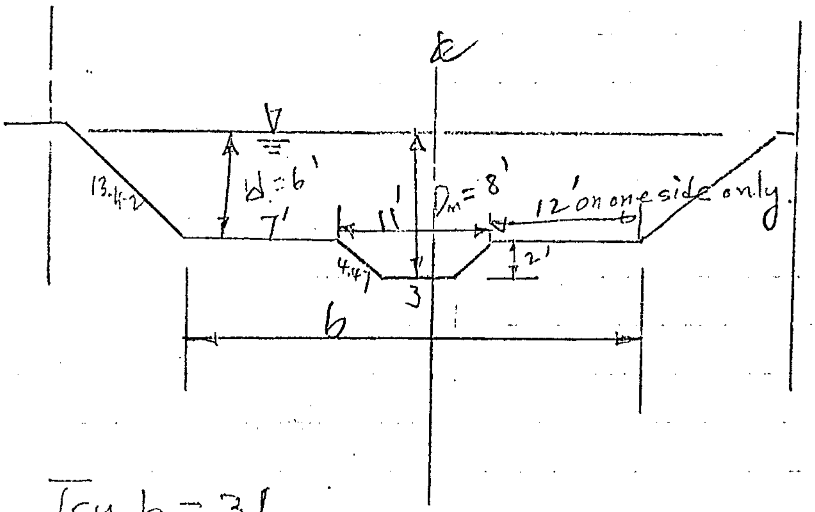
```
  WP PROG     1
     DATA
      1000.        Q1
        4.2         D
        31.         B
         2.         Z
      0.002         S
      0.025         N
      RUN
       47.8         T
     165.48         A
 3.32402821         R
979.7511412        Q2
 5.92066196         V
  Q1/Q2 RATIO
1.020667349
      END
```

3/11/81
143
y

LLAGAS CREEK – REACH 7B

Sta 96+40 – 138+00
$Q = 1550$
$S = .002$
$n = .035$

$$AR^{2/3} = \frac{Qn}{(1.486)(S^{1/2})} = \frac{(1550)(.035)}{(1.486)(.002)^{1/2}} = 817$$



Try b = 31

$A_1 = 14$ S.F.
$A_2 = 258$ S.F.
272 S.F.

$R = \frac{A}{P} = \frac{272}{57.78} = 4.7$

$AR^{2/3} = (2.81)(272) = 764$

Try $D_m = 6.5$

$A_2 = 286$ S.F
A_1 14
300 S.F

$R = \frac{300}{60} = 5$

$AR^{2/3} = 2.92 \times 300 = 876 \cong 817$

use $\boxed{\begin{array}{l} D_m = 6.5 \\ b = 31' \end{array}}$

$V = \frac{Q}{A} = \frac{1550}{300} = 5.2$ fps.

3/1/81
Ty

LLAGAS CREEK – REACH 7B

Check Box Culvert at Spring Ave. & Cosmo Ave. sta 130+20 40'

Find E channel

$V = 5.2$ fps

$$E = D_n + \frac{V^2}{2g} = 6.5 + 0.42 = 6.92$$

Proposed 8 X 8 Double Box

$b = 16'$

$$K' = \frac{(1550)(.015)}{(1625.5)(.045)} = 0.318$$

$\frac{D_n}{b} = 0.53$ $D_n = 8.48$

$$V = \frac{Q}{A} = \frac{1550}{135.7} = 11.42$$

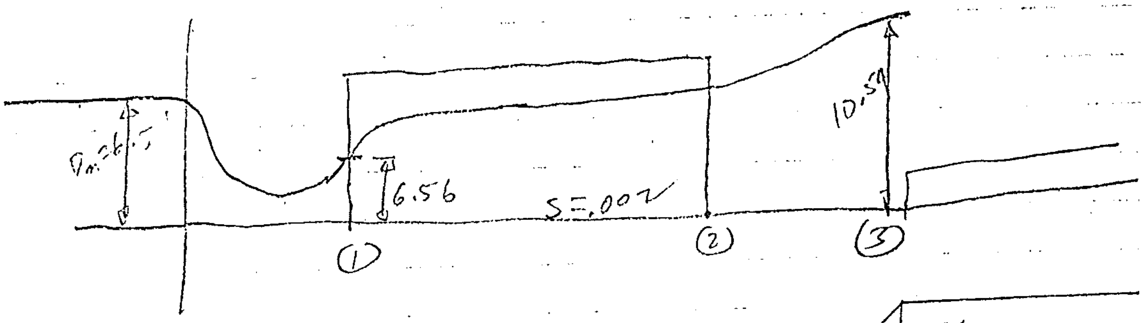
$E_{Box} = 2.03 + 8.48 = 10.51$ Box will control

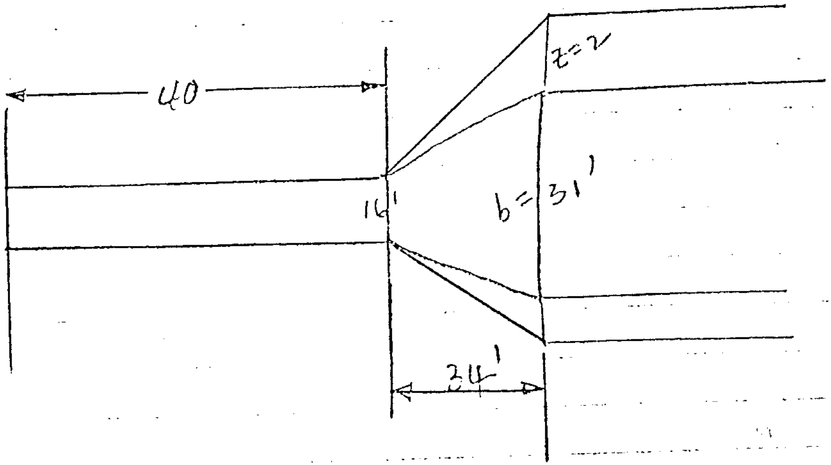
Find E_c

$$K_c' = \frac{Q}{b^{5/2}} = \frac{1550}{1024} = 1.51$$

$\frac{D_c}{b} = 0.41$ $D_c = 6.56$ $V = \frac{Q}{A} = \frac{1550}{105}$

$$E_c = 6.56 + 3.4 = 9.96$$





LLAGAS CREEK - 7B.

3/1/81

Box is too small ∴ Backwater upstream.

Try Double 10 × 8.

$$K' = \frac{(1550)(.015)}{(2947)(.045)} = 0.175$$

$\frac{D_n}{b} = 0.34$ $D_n = 6.8$

$V = \frac{Q}{A} = \frac{1550}{136} = 11.4$

$E_n = 2.01 + 6.8 = 8.81$

$K'_c = \frac{Q}{b^{5/2}} = \frac{1550}{1788.9} = 0.87$

$\frac{D_c}{b} = 0.29$ $D_c = 5.8'$ $V_c = \frac{Q}{A} = 13.3$

$E_c = 2.8 + 5.8 = 8.6$

use Double 10×8

```
STANDARD STEP METHOD


PROJECT
```

RCB at Spring & Cosmo Ave

Double 8x8

```
X  I  U     B      ZR    ZL     DEL X    EL      C     Q     N      Y     YC      A        V

1  1  1 ① 16.00   .00   .00       .00 323.97  .00  1550 .0149   6.56  6.62  104.96   14.76
      1 ② 16.00   .00   .00     40.00 324.05  .00  1550 .0149   7.14  6.63  114.31   13.55
      1 ③ 31.00  2.00  2.00     34.00 324.12  .25  1550 .0149  10.54  3.90  549.18    2.82
```

RCB at Spring & Cosmo Ave.

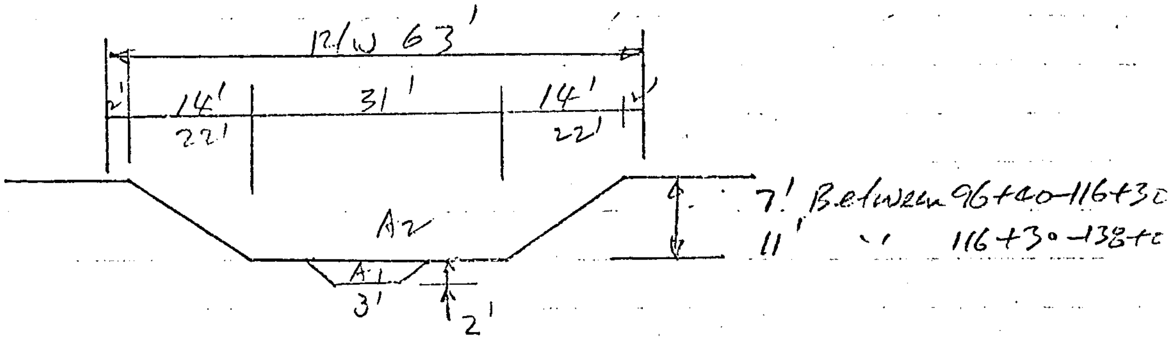
Double 10X8

```
1   1   1① 20.00   .00   .00       .00 323.97   .00   1550 .0149   5.80   5.71   116.00   13.36
        1② 20.00   .00   .00     40.00 324.05   .00   1550 .0149   6.07   5.71   121.49   12.75
        1③ 31.00  2.00  2.00     34.00 324.12   .25   1550 .0149   8.97   3.90   439.09    3.53
```

3/1/81
TY

LLAGAS CREEK – 7B (REACH)

Sta 96+40–138+00



Between Sta 96+40 – 116+30   63'
Between Sta 116+30 – 138+00   79' use 80

Void + Excavation

$$\begin{array}{l} A_1 = 14\text{ S.F} \\ \underline{A_2 = 315\text{ S.F}} \\ 329\text{ SF} \times \frac{1}{27} = 12.19\text{ C.Y/l.f} \times 1990 = 24{,}258\text{ C.Y.} \end{array}$$

Sta 96+40–116+30 (above)

Sta 116+30–138+00

$$\begin{array}{l} A_1 = 14 \\ \underline{A_2 = 583} \\ 597 \times \frac{1}{27} = 22.1\text{ C.Y/l.f} \times 2170 = \underline{47{,}957\text{ C.Y.}} \end{array}$$

72215 C.Y.

(See case 7 Cal.)   Less Creek Bottom   20,608

$\boxed{51607\text{ C.Y.}}$
Void

R/W to be Acq.

Between 96+40–116+30 (1990–640=1350 Dist owned)

$63' \times 1350 \times \frac{1}{43560} = 1.95\text{ Ac.}$

Between 116+30–138+00

$80 \times 560 \times \frac{1}{43560} = 1.03\text{ Ac.}$

$20 \times 600 \times \frac{1}{43560} = \underline{0.28\text{ Ac}}$

3.26 Ac
1.94 Crk Bottom wale plans
1.32 Ac.

LLAGAS CREEK — Reach 7B   revised (2)   3/11/8~~4~~9
TJ

Void
Add
{Clearing
[(63 X 1990)+(2170 X 80)] X $\frac{1}{43560}$ = $\boxed{6.9\ Ac}$

no Drop structure
Drainage inlets $\boxed{5\ ea}$
riprap $\boxed{168\ C.Y.}$

Box Culvert
Sta 130+20   Spring Ave use Double 10X8
1.8 C.Y/l.f X 40' = $\boxed{72\ C.Y.}$
Sta 144+00   Double 8X8   1.44 C.Y/l.f X 60
= $\boxed{86.4\ C.Y.}$

add 1 - 5X8
0.67 C.Y/l.f X 150 = $\boxed{100\ C.Y.}$
Change Private Bridge at Cosmo Ave to Double 10X8
1.8 C.Y/l.f X 32' = $\boxed{57.6}$

Total Concrete = 316 C.Y. ✓

~~2~~ 3 Private Bridges X 10 X 67 = ~~1340 S.F~~ 2,010 S.F. ✓

Provide fencing at Road crossings only

200'/crossing @ 3.5 locations = 700 l.f ✓

150
3/7/81

LLAGAS CREEK. — REACH 7B   CASE 7 REV 3

R/W Cost
Sta 11+00 – 65+00

Void

Total R/W to be Acq = 2.03 + 11.3 = $\boxed{13.33\ Ac}$
use \$20,000/Ac.

Sta 65+00 – 96+40
See case 7 Rev. 2 $\boxed{2.85\ Ac}$ use \$25000/Ac.

R/W Cost for Reach 7B (1)

From Edmunson Avenue to Cosmo Avenue

Sta 96+40 – 116+30	Net A.	Crk Bottom
30 X 150 X $\frac{1}{2}$ = 2250 S.F	1575 S.F (\$3)	
Assume 30% creek bottom		.02 Ac
10 X 13 = 130	130 S.F (\$3)	
60 X 60 = 360	3600 S.F (\$3)	
63 X 1,130 = 71190 S.F		
Less Crk 14238 (20%		.33 Ac
55952	55952 (\$3)	
50 X 130 = 6500	6500 (\$4)	
20 X 430 = 8600 S.F.	8600 (\$4)	
Crk Bottom 60 X 430 = 25800 S.F X $\frac{1}{43560}$		0.6 Ac
15 X 450 = 6750	6750 (\$6)	
230 X 50 = 11500	11500 (\$6)	
750 X 20 X $\frac{1}{4356}$ = 0.34 Ac		0.34
		1.3 Ac

✓ 1.26 OK

61257 S.F X 3 = \$ 183,771
15100 S.F X 4 = 60400
18250 S.F X 6 = 109500
\$ 353671

Void → Crk Bottom 1.3 X 100 = \$ 160

3/15/81
G 151

LLAGAS CREEK – Reach 7B · REV. 3

R/W Cost for 7B.

Void

From Edmunson Avenue to Cosno Avenue
Sta 96+40 – 116+30

		Anet	CrkBo
10 X 185 = 1850 S.F	$3/S.F	1850	
40X55 = 2,200 S.F.		2200	
63 X 1,110 = 69930 S.F	3/S.F.		
Less Creek 20% 13986 S.F			0.32
55944		55944	
40 X 430 = 17200 S.F.	$4/S.F	17,200	
Crk Bottom			0.6
180X55 = 9900 S.F	$6/S.F		
Crk bottom			0.34

59994 X 3 = $179,982
17200 X 4 = $ 68,800
9900 X 6 = $ 59,400
$308,182

crk bottom 1.26 X 100 = $126

Excavation
96+40 – 116+30   12.19 c.y/l.f X 680 = 8289
116+30 – 138+00   22.1 X 1160 = 25636
33925
Less crk bottom 17173 used see case 7a
16,752 C.Y.

Clearing
$[(63\times 260)+(80)(1030)]\times\frac{1}{43560}=3.1$

DMdM 1969

152

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LLAGAS CREEK - MODIFIED WORK PLAN

ESTIMATE OF CHANNEL COSTS

REACH NO. 76 WEST LITTLE LLAGAS
Station 96+40 to Station 144+00
CHANGE TO 86+40

Item	Quantity	Unit Cost	$
Channel Excavation	71,586	1.65 C.Y	118,117
Compacted Embankment	3,982	0.50 C.Y	1,991
Drop Structures	0	200.00 C.Y.	—
Drainage Inlets	5 EA	3000.00 EA	15,000.~~00~~
Riprap	168	20.00 C.Y.	3360
Filter Stone	126	15.00 C.Y	1,890
Seeding	4.93	650.00 AC.	3,205
Landscaping	—	L.S.	14,400
Structural Excavation	0	3.00 C.Y	—
Rectangular Concrete Channel	0	126.00 C.Y	—
Compacted Backfill	0	5.00 C.Y	—
Levee Embankment	0	1.25 C.Y.	—
Site Preparation (Levees)	0	3.00 L.F.	—

Subtotal	$ 157,963
15% Contingency	23,694
TOTAL	$ 181,657
	29,200
	210,857

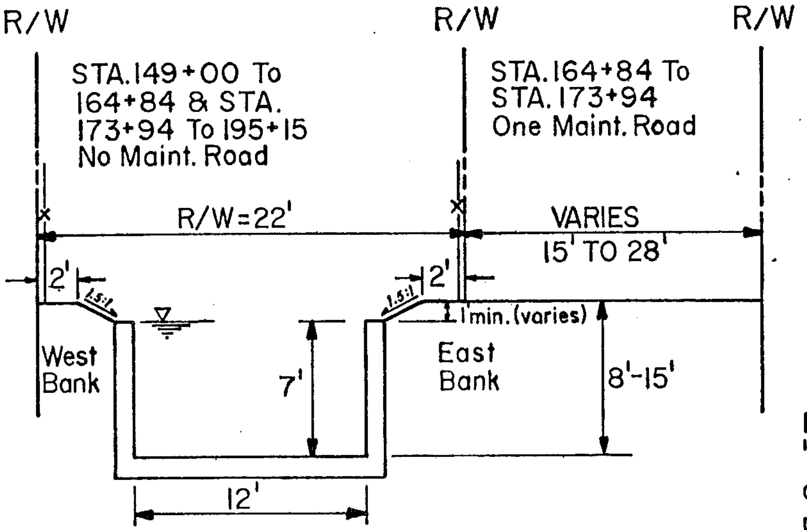
CHANGE TO 86+40 ADDS:
EXCAV. - 13,900 C.Y. @ 1.65 = 22,900
Comp. Emb. - 4,900 C.Y. @ 0.50 = 2,500
25,400 x 1.15 = 29,200

ENGR. (18.75%) = 40,000
OTHER (6.75%) = 15,000

Reach 8a

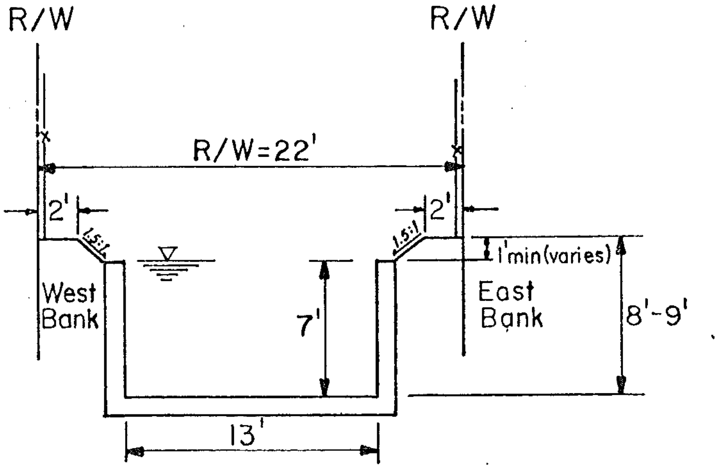
This reach extends from station 144+00 to 195+15 on West Little Llagas Creek. This is a rectangular reinforced concrete channel with a 1% event capacity. Eight (8) road culverts are required.

WEST LITTLE LLAGAS CREEK


R/W
R/W
R/W
STA.149+00 To 164+84 & STA. 173+94 To 195+15 No Maint. Road
STA.164+84 To STA.173+94 One Maint. Road
R/W=22'
VARIES 15' TO 28'
2'
1.5:1
1.5:1
2'
1'min.(varies)
West Bank
7'
East Bank
8'-15'
12'

Note: Possible future "lid" on top of concrete channel for pedestrian path from Dunne Ave. to Main Ave.

STA.149+00 (Fifth Ave.) To STA.195+15 (Wright Ave.)



STA.144+00 (Dunne Ave.) To STA.149+00 (Fifth Ave.)

DUNNE AVE. TO WRIGHT AVE.

(1% Capacity)

REACH 8A

FIGURE 9

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LLAGAS CREEK - SUPPLEMENTAL MODIFIED WORK PLAN

ESTIMATE OF CHANNEL COSTS

REACH NO. 8A case 7 REV. 3

Item	Quantity	Unit Cost	$
Channel Excavation			
Compacted Embankment			
Drop Structures			
Drainage Inlets	33	2,000	66,000
Riprap			
[illegible]er Stone	3171	20.00	63,420
[illegible]eeding			
Landscaping > [illegible]		~~3%~~ 1%	10,478 ~~31,435~~
Structural Excavation			
Rectangular Concrete Channel	3431	250 C.Y	857,750
Compacted Backfill	14,505	4.00	58,020
Levee Embankment	—	—	
Site Preparation (Levees)	2.31	1150	2657
Mobilization		3 [illegible]	31,750 ~~31,435~~

Subtotal [illegible] ~~1,110,717~~

to 12
~~15%~~ Contingency ~~133,286~~ [illegible]

TOTAL ~~1,244,003~~

1,220,844

Reduce landscaping from 3% to 1% due to reduced right of way DDH 7/28/81

LLAGAS CREEK - SUPPLEMENTAL MODIFIED WORK PLAN

ESTIMATE OF OTHER CONSTRUCTION COSTS

REACH NO. 7A Case 7 REV. 3

Item	Quantity	Unit Cost	$
~~State and County Bridges~~ fencing	8940	6	53,640.
~~Private Bridges~~			
RCB Culverts	710	350	248500
Relocation of Utilities			43,008

Subtotal 345,148

~~15~~ 12% Contingency 41,418

TOTAL 386,566

ESTIMATED COST OF LAND PURCHASE

Item	Quantity	Unit Cost	$
Creek Bottom	1.17	200	234
Agricultural			
Potential Residential (low value)			
Potential Residential (medium value)			
Residential/School	1.14 49658	$4.3/S.F	213,529
Dwellings	1	50,000	50,000

TOTAL 263763

Calif

LL Hansen 7/22/81

Reach 8a

Upper Llagas

Aged = As Built

144+00 - 149+00

```
WP PROG     1
  DATA
      950.     Q1
       5.7     D
       13.     B
        0.     Z
     0.003     S
     0.013     N
   RUN
       13.     T
      74.1     A
3.036885246    R
972.9112237    Q2
13.12970612    V
 Q1/Q2 RATIO
.9764508588
    END
```

```
WP PROG     1
  DATA
      610.     Q1
        4.     D
       13.     B
        0.     Z
     0.003     S
     0.013     N
   RUN
       13.     T
       52.     A
2.476190476    R
595.8845529    Q2
11.45931833    V
 Q1/Q2 RATIO
1.023688225
    END
```

149+00 - 195+15

```
WP PROG     1
  DATA
      810.     Q1
       6.2     D
       12.     B
        0.     Z
     0.002     S
     0.013     N
   RUN
       12.     T
      74.4     A
3.049180328    R
799.7460983    Q2
10.74927551    V
 Q1/Q2 RATIO
1.012821446
    END
```

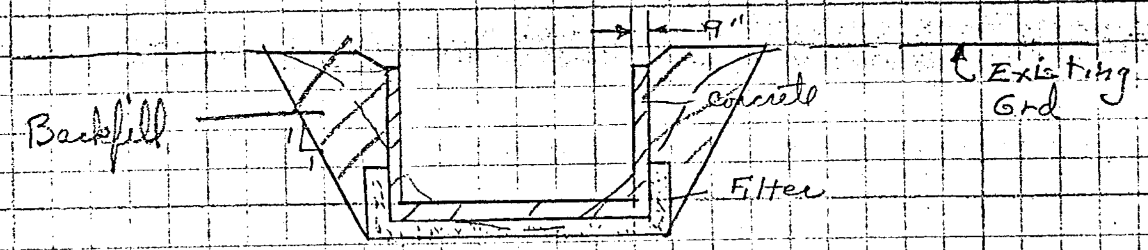
```
WP PROG     1
  DATA
      520.     Q1
       4.5     D
       12.     B
        0.     Z
     0.002     S
     0.013     N
   RUN
       12.     T
       54.     A
2.571428571    R
518.1241771    Q2
9.594892169    V
 Q1/Q2 RATIO
1.003620412
    END
```

COMPUTATION SHEET
SCS-ENG-523 Rev. 8-69

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

STATE Calif		PROJECT Llagas		
BY T.H.W.	DATE 4-29-81	CHECKED BY	DATE	JOB NO.
SUBJECT Volumes & Typical Section Alt F.				SHEET ____ OF ____

Typical Section



Back fill
9x9 = 81/27 = 3 cu yd/ft
3 X 4835 = 14,505 Cu yds x4 = $58,020

COMPUTATION SHEET **U. S. DEPARTMENT OF AGRICULTURE**
SCS–ENG–523 Rev. 8–69 **SOIL CONSERVATION SERVICE**

STATE Calif
PROJECT Llagas Creek
BY M. Corke DATE 4-29-81 CHECKED BY DATE JOB NO.
SUBJECT Concrete Volumes 144+00 ⇒ 195+15 SHEET ____ OF ____

Channel specs

280' of bores → 149+00 ⇒ 195+15

T 9" $d = 7'$ $b_1 = 12'$
$b_2 = 13'$

$L_1 = 4615'$
$- 280'$ bores
$L_1' = 4335'$

$WP_1 = 7+12+7 \Rightarrow 26'$

$WP_2 = 7+12+7 \Rightarrow 27'$

Area of Concret $A_1 = \frac{9}{12}[26] \Rightarrow 19.5 \text{ ft}^3/\text{ft}$

$A_2 = \frac{9}{12}[27] \Rightarrow 20.25 \text{ ft}^3/\text{ft}^3$

Vol concrete sta 149+00 ⇒ 195+15

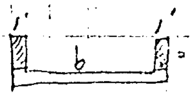
$19.5 \frac{\text{ft}^3}{\text{ft}} \cdot 4335' \div 27 \text{ ft}^3/\text{yd} \Rightarrow \underline{\underline{3131 \text{ yd}^3}}$

Vol concrete sta 144 00 ⇒ 149 00

$20.25 \frac{\text{ft}^3}{\text{ft}} \cdot 400' \div 27 \text{ ft}^3/\text{yd}^3 \Rightarrow \underline{\underline{300 \text{ yd}^3}}$

Total concrete ⇒ $\underline{\underline{3,431 \text{ yd}^3}}$ ⇐

Assume 1' thick 2ft² on side
Filter Volume b + 2' +



$A_{filter} = b + 6 \text{ ft}^2$

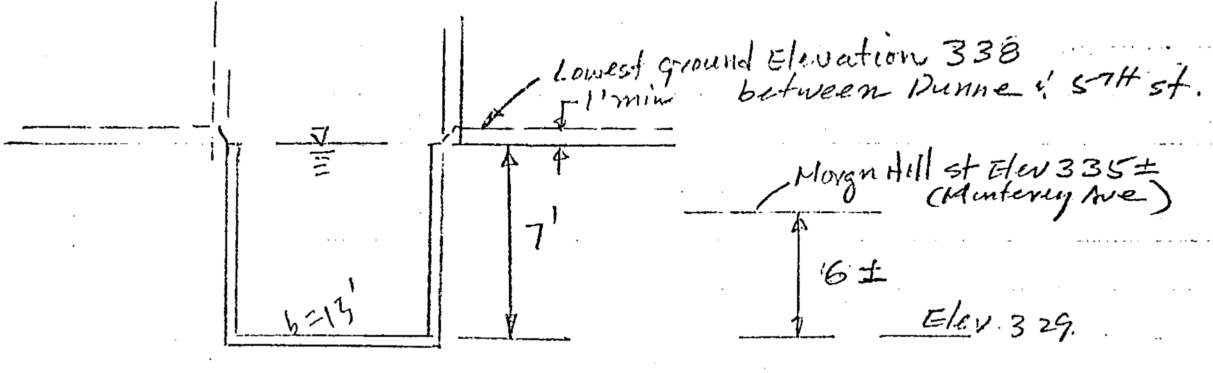
$A_1 = 18 \text{ ft}^3/\text{ft}$ $V_1 = (18)(4335') \div 27 \text{ ft}^3/\text{yd} = 2890 \text{ yd}^3$
$A_2 = 19 \text{ ft}^3/\text{ft}$ $V_2 = 19\,(400) \div 27 \text{ ft}^3/\text{yd} = \underline{281 \text{ yd}^3}$

Filter Requirements ⇒ $\underline{\underline{3171 \text{ yd}^3}}$

LLAGAS creek Reach 8A

Ty 161

Sta 144 — sta 149+00
$Q = 1{,}050$ →
$n = .015$
$S = .003$


Lowest ground Elevation 338 between Dunne & 5th st.
1' min
7'
b=13'
Morgan Hill st Elev 335± (Monterey Ave)
6±
Elev. 329.

$Q_{1\%} = 1050 \quad S = .0030 \quad n = .015$

$$K = \frac{Qn}{D^{8/3}S^{1/2}} = \frac{(1050)(.015)}{(7)^{8/3}(.003)^{1/2}} = \frac{(1050)(.015)}{(179.3)(.055)} = 1.60$$

$$\frac{Dn}{b} = \frac{7}{b} \qquad b = \frac{7}{.56} = 12.5 \quad \boxed{\text{use } 13'}$$

use single 13X8'

LLAGAS CREEK – REACH 8A

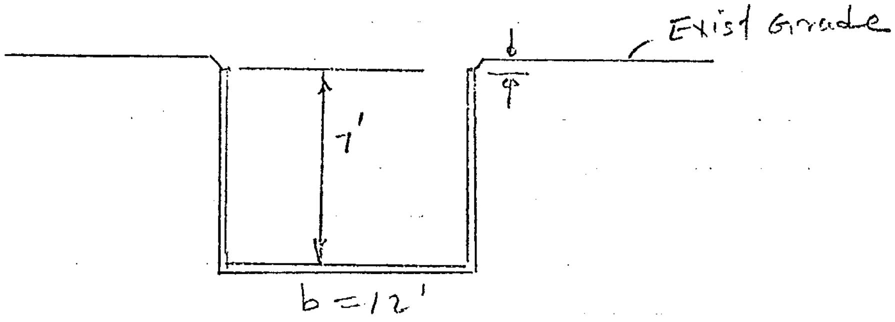
3/1/81 /162
Y

S/a 149+00 – 173+94 (5TH st to Main Ave)

$Q = 950$
$S = .003$
$n = .015$

$$K = \frac{Qn}{b^{8/3} s^{1/2}} = \frac{(950)(.015)}{(179.3)(.055)} = 1.45$$

$$b = \frac{7}{0.6} = 11.6 \quad \boxed{\text{use } 12'}$$



Single 12 X 8' for Box Culvert.

LLAGAS CREEK — REACH 8A

3/1/8/163

sta 173+94 — 195+15

$Q = 810$
$S = .002$
$n = .015$
$D_n = 7'$

$$K = \frac{Qn}{D^{8/3}S^{1/2}} = \frac{(810)(.015)}{(179.3)(.0445)} = 1.51$$

$$b = \frac{7}{0.59} = 11.86 \text{ use } 12'$$

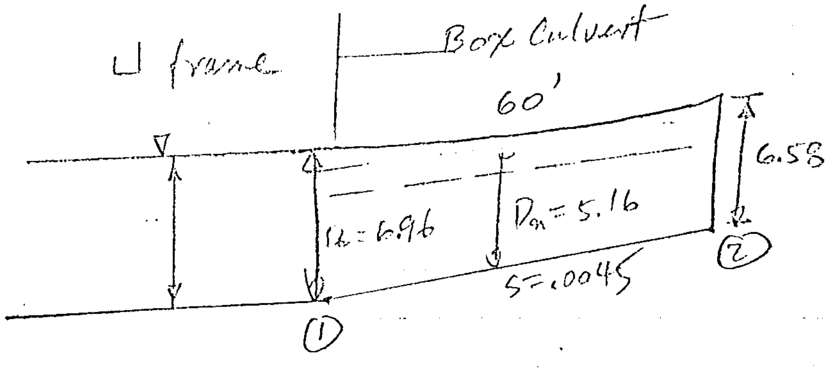
At Hale Ave use 1-12 X 8 Box Culvert

Check D_n at Box
$S = .0045$

$$K' = \frac{Qn}{b^{8/3}S^{1/2}} = \frac{(810)(.015)}{(754.8)(.067)} = 0.24$$

$\frac{D_n}{b} = 0.43$ $D_n = 5.16'$

$K'_c = \frac{Q}{b^{5/2}}$
$\frac{D_c}{b} = .433$
$D_c = 5.2$
Box in at critical depth



$$K'_{channel} = \frac{Qn}{b^{8/3}S^{1/2}} = \frac{(810)(.015)}{(754.8)(.045)} = 0.358$$

$\frac{D_n}{b} = 0.58$ $D_n = 6.96'$
$E_n = 8.42$

$V = \frac{Q}{A} = \frac{810}{83.52}$
$= 9.7$ fps

```
L  1   1 ①12.00   .00   .00        .00     .00   .00   810 .0149   6.96   5.21    83.52    9.69
       1 ②12.00   .00   .00      60.00     .27   .00   810 .0149   6.58   5.21    78.98   10.25
```

Comput
Up St
Dn. St.

STANDARD STEP METHOD

WANG

Project ______ Name ______ Date ______

(1) X	(2) I	(3) b	(4) Z_R	(5) Z_L	(6) Δx	(7) EI	(8) C	(9) Q	(10) n	(11) y	(12) $\frac{A^3}{T} - \frac{Q^2}{g}$	(1
φ	1	12	0	0	0	0	0	810	.015	6.96		
0	0	12	0	0	60	0.27	0					

3/1/8/66
TY

LLAGAS CREEK Reach 8 A.

check exist 10X8 Box.

$$K' = \frac{Qn}{S^{1/2} b^{8/3}} = \frac{(1050)(.015)}{(.0548)(464.2)} = 0.62$$

$$\frac{D_n}{b} = 0.89 \quad D_n = 8.9$$

The exist 10X8 Box is too small

add 1 - 5X8 Box.

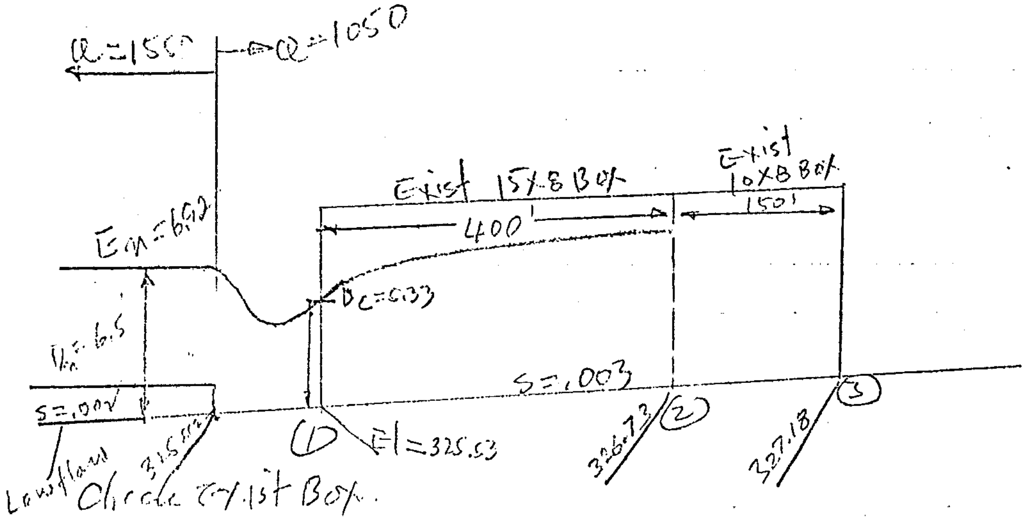
R.C.B at 144+00 Dunne Ave

Extend exist 15X8' to Dunne Ave ∴ use Double 8X8 is o.k.

LLAGAS Creek Reach 8B

3/1/81
Y

Sta 138+00 — 144+00



$$K' = \frac{Qn}{s^{1/2}b^{8/3}} = \frac{(1050)(.015)}{(.0548)(1368.5)} = 0.21$$

$$\frac{D_n}{b} = 0.39 \quad D_n = 5.85$$

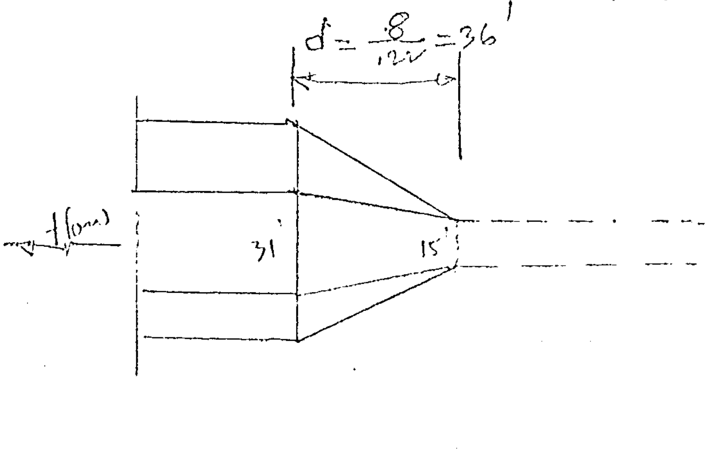
$$E_n = 2.22 + 5.85 = 8.07 \qquad V = \frac{Q}{A} = \frac{1050}{87.75} = 11.97$$

$$K_c' = \frac{Q}{b^{5/2}} = \frac{1050}{871.4} = 1.2$$

$$\frac{D_c}{b} = 0.355 \quad D_c = 5.33$$

$$V_c = \frac{Q}{A} = \frac{1050}{79.95} = 13.1$$

$$E_c = 2.66 + 5.33 = 7.99$$



```
                                                                               VOP
1  1  1    15.00  .00  .00        .00 325.53  .00  1050 .0149   5.33    5.33    79.95  13.13
      1    15.00  .00  .00     400.00 329.30  .00  1050 .0149   1.62    5.33    24.39  43.03
1  1  1    36.00  .00  .00        .00 100.07  .00  2200 .0149   4.87    4.87   175.32  12.54



1  1  1 ① 15.00  .00  .00        .00 325.53  .00  1050 .0149   5.33    5.33    79.95  13.13 } exist 15x8
      1 ② 15.00  .00  .00     400.00 326.73  .00  1050 .0149   6.02    5.33    90.43  11.61 }
or                                            Box is too small
      1 ③ 10.00  .00  .00       6.00 326.75  .10  1050 .0149-24.86    6.98    66.61  15.76  Exist 10x8
```

Computı
Up St.
Dn. St.

STANDARD STEP METHOD

WANG

Project

Name

Date

(1) X	(2) I	(3) b	(4) Z_R	(5) Z_L	(6) Δx	(7) El	(8) C	(9) Q	(10) n	(11) y	(12) $\frac{A^3}{T}$ $\frac{Q^2}{g}$	(1
1	1	16	0	0	0	323.97	0	1550	.015	6.56 Double	8 X 8	
0	0	16	0	0	40	324.05	0					
0	0	31	2	2	34	324.12	.25					
1	1	20	0	0	0	323.97	0	1550	.015	5.8 Double	8X10	
0	0	20	0	0	40	324.05	0					
0	0	31	2	2	34	324.12	0.25					
1	1	31	2	2	0	325.42	0	1050	.015	6.5		
0	0	15	0	0	36	325.53	0.1					
1	1	15	0	0	0	325.53	0	1050	.015 ~~[illegible]~~	5.33		
0	0	15	0	0	400	326.73	0					
0	0	10	0	0	6	326.75	0.1					
0	0	10	0	0	144	327.18	0					

4/9/81
TJ 170

Reach 8A

R/W Costs

Between Wright Ave & W Main
1980 X 22 = 43,560 s.F
Between W Main & Warren Ave.
620 X 22 = 13,640 s.F.
150 X 60 = 9,000 s.F
(150 + 150) X 22 = 6,600 s.F
W Second st – Dunne.
1270 ft X 22 = 27940 S.F
100,740 S.F ≅ 2.31 AC.
Creek hollow 1.17 (From SCS report
1.14
49658 s.F X $4.3 ≠ = ~~263,763~~ NG 213529

Fencing 4320 l.f + Road crossing X 2 = 8640 l.f
13 road crossing @ 22' ea = 286 say 300 l.f
Total fencing (8640 + 300) X $6/l.f = $53640
use $54,000

R/W Costs

Between Wright Ave & W Main
1980 X 22 = 43,560 s.F
Between W Main & Warren Ave.
620 X 22 = 13,640 s.F
150 X 60 = 9,000 s.F
(150 + 150) X 22 = 6,600 s.F
W Second st – Duane.
1270 ft X 22 = 27940 S.F
100,740 S.F ≃ 2.31 Ac.

Creek bottom
1.17 (From [illegible] report)
1.14

49658 s.F X $4.3 = 263,763

Fencing
4320 l.f + Road crossing X 2 = 8640 l.f
[illegible] road crossing(s) 22' each = 286 say 300 l.f

Total fencing (8640 + [illegible]) X $6/l.f = $53,[illegible]
≈ $[illegible],000

RCB Culvert	Concrete CY/l.f	Size	Length	[illegible]
5th Ave	1.39 (Assume [illegible] 7X7)	14X3	50	70
4th Ave	1.08	12X3	80'	86
3rd Ave	1.08	12X3	70	76
2nd Ave	1.08	12X3	250	270
Warren	1.08	12X3	50'	54
Main Ave	1.08	12X3	50	54
Wright	1.08	12X3	70'	97
				707

Use 710 CY

		SPAN	2'	2'	3'	3'	3'	4'	4'	4'	4'	4'	4'
		HEIGHT	1'-6"	2'	2'	3'	3'	2'	3'	3'	4'	4'	4'
STRENGTH CLASSIFICATION			A	A	A	A	B	A	A	B	A	B	C
MAX FILL OVER TOP			66		38	38	66	28	28	37	28	37	50
Conc	Top Slab	T_1	6	6	6¼	6¼	8	7	7	8	7	8	9
Conc	Bottom Slab	T_2	6	6	6¼	6¼	8	7	7	8	7	8	9
Conc	Sidewalls	T_3	6	6	6	6	6	6	6	6	6	6	6
Reinforcing Steel "a"	Size Bar *		4	4	4	4	5	5	5	5	5	5	6
Reinforcing Steel "a"	Spacing		3½	3½	3½	3½	4	5	5	4½	5	4½	5
Reinforcing Steel "a"	Length		3-2	3-2	4-2	4-2	4-3	5-3	5-3	5-3	5-3	5-3	5-2
"d" Dist Bars	Top Slab - No of		2	2	3	3	2	5	5	3	5	3	3
"d" Dist Bars	Bottom Slab - No of		2	2	2	2	2	3	3		3		3
"e" Bars	Spacing		18	18	18	18	12½	18	18	18	17	13	9½
Spacers	Number		12	12	12	12		12	12		14		
Quan	Concrete CY per lin ft		.17	.16	.23	.27	.31	.29	.33	.36	.35	.40	.43
Quan	Reinf lbs per lin ft		27	29	34	36	46	44	45	47	48	52	64

		SPAN	5'	5'	5'	5'	5'	5'	5'	5'	5'	5'	5'	5'
		HEIGHT	2'	2'	3'	3'	4'	4'	4'	4'	5'	5'	5'	5'
STRENGTH CLASSIFICATION			A	B	A	B	A	B	C	D	A	B	C	D
MAX FILL OVER TOP			12	27	12	27	11	25	35	46	11	25	35	46
Conc	Top Slab	T_1	7½	8	7½	8	7½	8	9½	10½	7½	8	9½	10½
Conc	Bottom Slab	T_2	6	8	6	8	6	8	10	10¾	6	8	10	10¾
Conc	Sidewalls	T_3	6	6	6	6	6	6	6	6	6	6	6	6
Reinforcing Steel "a"	Size Bar *		5	5	5	5	5	5	6	6	5	5	6	6
Reinforcing Steel "a"	Spacing		4	4	4	4	4	4	5	4½	4	4	5	4½
Reinforcing Steel "a"	Length		6-3	6-3	6-3	6-3	6-3	6-3	6-2	6-2	6-3	6-3	6-2	6-2
"d" Dist Bars	Top Slab - No of		7	3	7	3	7	3		3	7	3		3
"d" Dist Bars	Bottom Slab - No of		3		3			3		3	3	3		3
"e" Bars	Spacing		18	16	18	18	16	17	13	11	16	12	8½	6½
Spacers	Number		14		14		14					16		
Quan	Concrete CY per lin ft		.32	.37	.36	[illegible]	.40	.44	.51	.54	.43	.48	.55	.57
Quan	Reinf lbs per lin ft		57	56	59	57	61	60	65	75	63	65	77	67

		SPAN	6'	6'	6'	6'	6'	6'	6'	6'	6'	6'	6'	6'	6'	6'	6'	6'	6'	6'	6'	6'	6'
		HEIGHT	2'	2'	3'	3'	4'	4'	4'	5'	5'	5'	5'	6'	6'	6'	6'	6'	7'	7'	7'	7'	7'
STRENGTH CLASSIFICATION			A	B	A	B	A	B	C	A	B	C	D	A	B	C	D	E	A	B	C	D	E
MAX FILL OVER TOP			10	[illegible]		8	[illegible]	[illegible]	[illegible]	9	[illegible]	25	36	9	[illegible]	25	36	45	9	[illegible]	25	35	45
Conc	Top Slab	T_1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Conc	Bottom Slab	T_2	6¾	8	6¾	8	6¾	8	9¾	7¼	8¾	10	11¼	7¼	8¾	10½	11¾	[illegible]	7¼	8¾	[illegible]	[illegible]	[illegible]
Conc	Sidewalls	T_3	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6¼	7	6	6	6¼	7	7¼
Reinforcing Steel "a"	Size Bar *		5	5	5	5	5	5	6	5	5	6	6	5	5	6	7	7	5	5	6	7	7
Reinforcing Steel "a"	Spacing		4	4	4	4	4	4	5	4	4	5	4½	4	4	5	5½	5	4	4	5	5½	5
Reinforcing Steel "a"	Length		7-3	7-3	7-3	7-3	7-3	7-3	7-2	7-3	7-3	7-2	7-2	7-3	7-3	7-2	7-3	7-5	7-3	7-3	[illegible]	7-5	7-5
"d" Dist Bars	Top Slab - No of		7	4	7	4	7	4		7	4		4	7	4		4	4	7	4		4	4
"d" Dist Bars	Bottom Slab - No of		4		4			4			4		4		4		4	4		4		4	4
"e" Bars	Spacing		18	18	18	18	18	[illegible]	[illegible]	16	[illegible]	[illegible]	5½	[illegible]	10½	7½	6	5	12	7½	7	5	4½
Spacers	Number		12		12			12			[illegible]					15					18		
Quan	Concrete CY per lin ft		.40	.42	.43	.46	.47	.50	.48	.52	.54	.60	.66	.56	[illegible]	.65	.71	.78	.59	[illegible]	[illegible]	.78	.86
Quan	Reinf lbs per lin ft		64	63	66	65	69	67	74	70	70	80	91	[illegible]	[illegible]	92	[illegible]	[illegible]	[illegible]	95	[illegible]	[illegible]	39

Note:

For boxes of height less than that shown in table, use next greater table height box, wall dimensions and reinforcing steel, and make necessary changes in bar lengths, number of spacers and quantities.

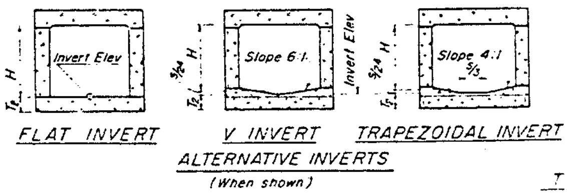
		SPAN	7'	7'	7'	7'	7'	7'	7'	7'	7'	7'	7'	7'	7'
		HEIGHT	3'	3'	4'	4'	5'	5'	5'	6'	6'	6'	7'	7'	7'
STRENGTH CLASSIFICATION			A	B	A	B	A	B	C	A	B	C	A	B	C
MAX FILL OVER TOP			16	26	16	26	16	26	35	16	26	35	16	26	35
Conc	Top Slab	T_1	7¼	8¼	7¼	8¼	7¼	8¼	9¾	7¼	8¼	9¾	7¼	8¼	9¾
Conc	Bottom Slab	T_2	7½	8¾	7½	8¾	7½	8¾	10½	7½	8¾	10½	7½	8¾	10½
Conc	Sidewalls	T_3	6	7	6	7	6	7	8½	6	7	8½	6	7	8½
Reinforcing Steel "a"	Size Bar *		5	5	5	5	5	5	6	5	5	6	5	5	6
Reinforcing Steel "a"	Spacing		9	7	9	7	9	7	9	9	7	9	9	7	9
Reinforcing Steel "a"	Length		6-8	5-9	6-6	6-9	6-8	5-9	6-10	6-8	6-9	6-10	6-8	6-9	6-10
Reinforcing Steel "b"	Size Bar *		5	5	5	5	5	5	6	5	5	6	5	5	6
Reinforcing Steel "b"	Spacing		9	7	9	7	9	7	9	9	7	9	9	7	9
Reinforcing Steel "b"	Dimension "X"		1-3	1-4	1-3	1-4	1-3	1-4	1-8	1-3	1-4	1-8	1-3	1-4	1-8
Reinforcing Steel "b"	Length		3-1	3-2	3-1	3-2	3-1	3-2	3-10	3-1	3-2	3-10	3-1	3-2	3-10
Reinforcing Steel "c"	Size Bar *		5	5	5	5	5	5	6	5	5	6	5	5	6
Reinforcing Steel "c"	Spacing		9	7	9	7	9	7	9	9	7	9	9	7	9
Reinforcing Steel "c"	Dimension "Y"		1-10	1-11	1-10	1-11	1-10	1-11	2-3	1-10	1-11	2-3	1-10	1-11	2-3
Reinforcing Steel "c"	Length		5-2	5-4	6-2	6-4	7-2	7-4	7-10	8-2	8-4	8-10	9-2	9-4	9-10
Reinforcing Steel "c_1"	Size Bar *		5	5	5	5	5	5	6	5	5	6	5	5	6
Reinforcing Steel "c_1"	Spacing		9	7	9	7	9	7	9	9	7	9	9	7	9
Reinforcing Steel "c_1"	Dimension "Y"		1-10	1-11	1-10	1-11	1-10	1-11	2-3	1-10	1-11	2-3	1-10	1-11	2-3
Reinforcing Steel "c_1"	Length		3-8	3-10	3-8	3-10	3-8	3-10	4-6	3-8	3-10	4-6	3-8	3-10	4-6
"d" Bars	Top Slab - No of		7	4	7	4	7	4	4	7	4	4	7	4	4
"d" Bars	Bottom Slab - No of		4	4	4	4	4	4	4	4	4	4	4	4	4
"e" Bars	Spacing		18	18	18	18	18	18	18	18	18	16	18	18	18
Spacers	Total Number		24		28		28			32			36		
Quan	Concrete CY per lin ft		.47	.56	.51	.60	.55	.64	.72	.56	.68	.84	.62	.73	.89
Quan	Reinf lbs per lin ft		107	130	114	138	118	143	166	125	150	176	132	158	184

		SPAN	8'	8'	8'	8'	8'	8'	8'	8'	8'	8'	8'	8'	8'	8'	8'
		HEIGHT	3'	3'	4'	4'	5'	5'	6'	6'	6'	7'	7'	7'	8'	8'	8'
STRENGTH CLASSIFICATION			A	B	A	B	A	B	A	B	C	A	B	C	A	B	C
MAX FILL OVER TOP			13	21	13	21	13	21	13	21	31	13	21	31	13	21	31
Conc	Top Slab	T_1	7¼	8½	7¼	8½	7¼	8½	7¼	8½	10¼	7¼	8½	10¼	7¼	8½	10¼
Conc	Bottom Slab	T_2	7¼	9½	7¼	9½	7¼	9½	7½	9½	11½	7½	9½	11½	7½	9½	11½
Conc	Sidewalls	T_3	6½	7½	6½	7½	6½	7½	6½	7½	9¾	6½	7½	9¾	6½	7½	9¾
Reinforcing Steel "a"	Size Bar *		5	5	5	5	5	5	5	5	6	5	5	6	5	5	6
Reinforcing Steel "a"	Spacing		9	7	9	[illegible]	9	7	9	7	8	9	7	8	9	7	8
Reinforcing Steel "a"	Length		7-7	7-8	7-7	7-6	7-7	7-8	7-7	7-8	7-10	7-7	7-8	7-10	7-7	7-8	7-10
Reinforcing Steel "b"	Size Bar *		5	5	5	5	5	5	5	5	6	5	5	6	5	5	6
Reinforcing Steel "b"	Spacing		9	7	9	7	9	7	9	7	8	9	7	8	9	7	8
Reinforcing Steel "b"	Dimension "X"		1-6	1-7	1-6	1-7	1-6	1-7	1-6	1-7	1-8	1-6	1-7	1-8	1-6	1-7	1-8
Reinforcing Steel "b"	Length		3-4	3-5	3-4	3-5	3-4	3-5	3-4	3-5	3-10	3-4	3-5	3-10	3-4	3-5	3-10
Reinforcing Steel "c"	Size Bar *		5	5	5	5	5	5	5	5	6	5	5	6	5	5	6
Reinforcing Steel "c"	Spacing		9	7	9	[illegible]	9	7	9	7	8	9	7	8	9	7	8
Reinforcing Steel "c"	Dimension "Y"		2-0	2-5	2-0	2-5	2-0	2-5	2-0	2-5	2-8	2-0	2-5	2-8	2-0	2-5	2-8
Reinforcing Steel "c"	Length		5-4	5-10	6-4	6-10	7-4	7-10	8-4	8-10	9-3	9-4	9-10	10-3	10-4	10-10	11-3
Reinforcing Steel "c_1"	Size Bar *		5	5	5	5	5	5	5	5	6	5	5	6	5	5	6
Reinforcing Steel "c_1"	Spacing		9	7	9	7	9	7	9	7	8	9	7	8	9	7	8
Reinforcing Steel "c_1"	Dimension "Y"		2-0	2-5	2-0	2-5	2-0	2-5	2-0	2-5	2-8	2-0	2-5	2-8	2-0	2-5	2-8
Reinforcing Steel "c_1"	Length		3-9	4-5	3-9	4-5	3-9	4-5	3-9	4-5	5-0	3-9	4-5	5-0	3-9	4-5	5-0
"d" Bars	Top Slab - No of		7	5	7	5	7	5	7	5	5	7	5	5	7	5	5
"d" Bars	Bottom Slab - No of		5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
"e" Bars	Spacing		18	18	18	16	18	18	16	18	18	16	18	16	16	16	18
Spacers	Total Number		28		32		32		36			40			40		
Quan	Concrete CY per lin ft		.52	.65	.56	.70	.60	.74	.65	.79	1.00	.69	.83	1.06	.73	.68	1.12
Quan	Reinf lbs per lin ft		118	146	125	154	129	159	136	167	211	143	174	220	147	179	225

		SPAN	10'	10'	10'	10'	10'	10'	10'	10'	10'	10'	10'	10'	10'	10'	10'	10'	10'
		HEIGHT	4'	4'	5'	5'	6'	6'	7'	7'	8'	8'	8'	9'	9'	9'	10'	10'	10'
STRENGTH CLASSIFICATION			A	B	A	B	A	B	A	B	A	B	C	A	B	C	A	B	C
MAX FILL OVER TOP			9	19	9	18	9	18	9	16	8	15	28	8	16	25	8	18	28
Conc	Top Slab	T_1	8	9½	8¼	9¾	8¼	9¾	8½	9¾	8½	9¾	12¼	8½	9¾	12¼	8½	9¾	12¼
Conc	Bottom Slab	T_2	8¾	10½	9	10¾	9	10¾	9¼	11	9¼	11	13½	9¼	11	13½	9¼	11	13½
Conc	Sidewalls	T_3	7¼	9½	7¼	9½	7¼	9½	7¼	9½	7¼	9½	11½	8	9½	11½	9	9½	11½
Reinforcing Steel "a"	Size Bar *		6	6	6	6	6	6	6	6	6	6	7	6	6	7	6	6	7
Reinforcing Steel "a"	Spacing		11	8	11	8	11	8	11	8	11	8	9	11	8	9	11	8	9
Reinforcing Steel "a"	Length		9-5	9-6	9-5	9-8	9-5	9-6	9-5	9-8	9-5	9-8	9-9	9-5	9-6	9-9	[illegible]	9-8	9-9
Reinforcing Steel "b"	Size Bar *		5	6	5	6	5	6	5	6	5	5	6	5	5	6	[illegible]	6	6
Reinforcing Steel "b"	Spacing		11	8	11	8	11	8	11	8	11	8	9	11	8	9	[illegible]	8	9
Reinforcing Steel "b"	Dimension "X"		2-0	2-0	2-0	2-0	2-0	2-0	2-0	2-0	2-0	2-0	2-6	2-0	2-0	2-6	2-0	2-0	2-6
Reinforcing Steel "b"	Length		3-0	4-2	3-10	4-2	3-10	4-2	3-10	4-2	3-10	4-2	4-6	3-10	4-2	4-6	3-10	4-2	4-6
Reinforcing Steel "c"	Size Bar *		5	6	5	6	5	6	5	6	5	6	6	5	6	6	5	6	6
Reinforcing Steel "c"	Spacing		11	8	11	8	11	8	11	8	11	8	9	11	8	9	11	8	9
Reinforcing Steel "c"	Dimension "Y"		2-8	3-4	2-8	3-4	2-8	3-4	2-8	3-4	2-8	3-4	3-6	2-8	3-4	3-6	2-8	3-4	3-6
Reinforcing Steel "c"	Length		6-1	7-3	8-1	[illegible]	9-1	9-10	10-1	10-10	11-1	11-10	[illegible]	12-1	12-10	[illegible]	[illegible]	13-10	14-3
Reinforcing Steel "c_1"	Size Bar *		5	6	5	6	5	6	5	6	5	6	6	5	6	6	5	6	6
Reinforcing Steel "c_1"	Spacing		[illegible]	8	11	8	11	8	11	8	11	8	9	11	8	9	11	8	9
Reinforcing Steel "c_1"	Dimension "Y"		2-8	3-4	2-8	3-4	2-8	3-4	2-8	3-4	2-8	3-4	3-6	2-8	3-4	3-6	2-8	3-4	3-6
Reinforcing Steel "c_1"	Length		4-7	5-8	4-7	5-8	4-7	5-8	4-7	5-8	4-7	5-8	6-0	4-7	5-8	6-0	4-7	5-8	6-2
"d" Bars	Top Slab - No of		9	5	9	5	9	5	9	5	9	5	5	9	5	5	9	5	5
"d" Bars	Bottom Slab - No of		5	5	5	5	5	5	[illegible]	5	5	5	5	5	5	5	5	5	5
"e" Bars	Spacing		16	18	18	15	18	18	15	16	18	18	18	16	18	18	18	16	18
Spacers	Total Number		32		34		36		40		40			44			46		
Quan	Concrete CY per lin ft		.75	.94	.82	1.02	.66	1.08	.92	[illegible]	.97	1.21	1.50	[illegible]	1.26	[illegible]	[illegible]	1.32	[illegible]
Quan	Reinf lbs per lin ft		143	[illegible]	148	225	164	235	160	244	164	257	[illegible]	[illegible]	269	273	178	287	[illegible]

		SPAN	12'	12'	12'	12'	12'	12'	12'	12'	12'	12'	12'	12'	12'	12'	12'
		HEIGHT	6'	6'	7'	7'	8'	8'	9'	9'	9'	10'	10'	10'	12'	12'	12'
STRENGTH CLASSIFICATION			A	B	A	B	A	B	A	B	C	A	B	C	A	B	C
MAX FILL OVER TOP			5	16	5	16	5	16	5	16	24	5	16	24	5	16	24
Conc	Top Slab	T_1	8¾	11¼	8¾	11¼	8¾	11¼	9	11¼	13¼	9	11¼	13¼	9	11¼	13¼
Conc	Bottom Slab	T_2	8¾	12¼	8¾	12¼	8¾	12½	9	12½	14¾	9	12½	14¾	9	12½	14¾
Conc	Sidewalls	T_3	7½	10½	7½	10½	7½	10½	8	10½	12½	9	10½	12½	9	10½	12½
Reinforcing Steel "a"	Size Bar *		6	7	6	7	6	7	6	7	7	6	7	7	6	7	7
Reinforcing Steel "a"	Spacing		11	10	11	10	11	10	11	10	8	11	10	8	11	10	8
Reinforcing Steel "a"	Length		11-3	11-6	11-3	11-6	11-3	11-6	11-4	11-6	11-8	11-5	11-5	11-8	11-5	11-6	11-8
Reinforcing Steel "b"	Size Bar *		6	7	6	7	6	7	[illegible]	7	7	6	7	7	6	7	7
Reinforcing Steel "b"	Spacing		[illegible]	10	[illegible]	10	[illegible]	10	[illegible]	10	8	11	10	8	11	10	8
Reinforcing Steel "b"	Dimension "X"		2-8	3-0	2-8	3-0	2-8	3-0	2-8	3-0	3-0	2-8	3-0	3-0	2-8	3-0	3-0
Reinforcing Steel "b"	Length		4-0	5-7	4-0	5-7	4-0	5-7	4-0	5-7	5-7	4-10	5-7	5-7	4-10	5-7	5-7
Reinforcing Steel "c"	Size Bar *		6	7	6	7	6	7	6	7	7	6	7	7	6	7	7
Reinforcing Steel "c"	Spacing		11	10	11	10	11	10	11	10	8	11	10	8	11	10	8
Reinforcing Steel "c"	Dimension "Y"		3-9	3-9	3-9	3-9	3-9	3-9	3-9	3-9	3-9	3-9	3-9	3-9	3-9	3-9	3-9
Reinforcing Steel "c"	Length		10-2	10-4	11-2	11-4	12-2	12-4	13-2	13-4	13-6	14-2	14-4	14-6	16-2	16-4	16-6
Reinforcing Steel "c_1"	Size Bar *		6	7	6	7	6	7	6	7	7	6	7	7	6	7	7
Reinforcing Steel "c_1"	Spacing		11	10	11	10	11	10	11	10	8	11	10	8	11	10	8
Reinforcing Steel "c_1"	Dimension "Y"		3-9	3-9	3-9	3-9	3-9	3-9	3-9	3-9	3-9	3-9	3-9	3-9	3-9	3-9	3-9
Reinforcing Steel "c_1"	Length		[illegible]	6-5	[illegible]	6-5	[illegible]	6-6	[illegible]	6-6	6-6	5-11	6-6	6-8	5-11	6-6	6-8
"d" Bars	Top Slab - No of		10	6	10	6	10	6	10	6	6	10	6	6	10	6	6
"d" Bars	Bottom Slab - No of		6	6	6	6	6	6	6	6	6	6	6	6	6	6	6
"e" Bars	Spacing		16	16	18	15	18	15	18	5	18	16	16	16	16	15	16
Spacers	Total Number		36		44		44		44			46			52		
Quan	Concrete CY per lin ft		.99	1.16	1.03	1.44	1.26	1.32	1.18	1.58	1.90	1.30	1.65	1.98	[illegible]	1.78	2.13
Quan	Reinf lbs per lin ft		[illegible]	293	213	304	216	311	223	317	367	[illegible]	326	397	243	341	415

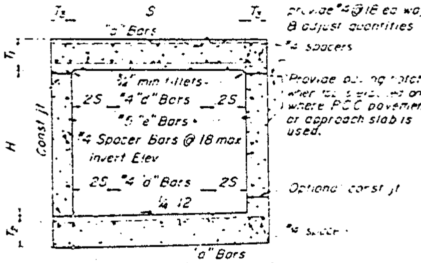
* For reinforcement clearance, except at bottom, see "Miscellaneous Details"



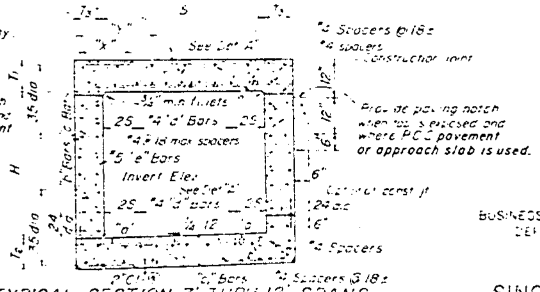
FLAT INVERT V INVERT TRAPEZOIDAL INVERT

ALTERNATIVE INVERTS

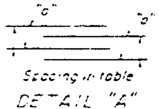
(When shown)



TYPICAL SECTIONS 2' THRU 6' SPANS



TYPICAL SECTION 7' THRU 12' SPANS



Spacing in table

DETAIL "A"

STATE OF CALIFORNIA
BUSINESS AND TRANSPORTATION AGENCY
DEPARTMENT OF TRANSPORTATION

SINGLE BOX CULVERT

D80-2

JUNE, 1974

173

57

SPAN	4'	4'	4'	4'	4'	4'	4'	4'	4'
HEIGHT	2'	2'	2'	3'	3'	3'	4'	4'	4'
STRENGTH CLASSIFICATION	A	B	C	A	B	C	A	B	C
MAX FILL OVER TOP	10	24	38	10	24	38	10	24	38
Conc Top Slab T_1	6¼	6¼	7¼	6¼	6¼	7¼	6¼	6¼	7¼
Conc Bottom Slab T_2	6	7	8¼	6	7	8¼	6	7	8¼
Conc Sidewalls T_3	6	6	6	6	6	6	6	6	6
Reinforcing Steel "a" Size Bar #	5	4	5	5	4	5	5	4	5
"a" Spacing	11	11½	13	11	11½	13	11	11½	13
"a" Length	14-9	14-8	14-9	14-9	14-8	14-9	14-9	14-8	14-9
"b" Size Bar #	5	5	6	5	5	6	5	5	6
"b" Spacing	11	11½	13	11	11½	13	11	11½	13
"b" Length	14-2	14-2	14-3	14-2	14-2	14-3	14-2	14-2	14-3
"b1" Length	14-0	14-2	14-3	14-0	14-2	14-3	14-0	14-2	14-3
"c" Size Bar #	4	5	6	4	5	6	4	5	6
"c" Spacing	11	11½	13	11	11½	13	11	11½	13
"c" Length	9-0	9-0	9-0	9-0	9-0	9-0	9-0	9-0	9-0
"d" Dist Bars Top Slab-Tot No	15	9	9	15	9	9	15	9	9
"d" Dist Bars Bottom Slab-Tot No	9	9	9	9	9	9	9	9	9
"e" Bars Size Bar #	4	4	4	4	4	4	4	4	5
"e" Bars Spacing	18	18	18	18	18	13	18	11½	13
Spacers Number	34			38			42		
Quan Concrete CY per lin ft	057	071	081	075	079	089	062	066	096
Quan Reinf Lbs per lin ft	122	110	133	127	115	138	131	122	147

SPAN	5'	5'	5'	5'	5'	5'	5'	5'	5'	5'	5'	5'	5'	5'
HEIGHT	2'	2'	2'	3'	3'	3'	4'	4'	4'	4'	5'	5'	5'	5'
STRENGTH CLASSIFICATION	A	B	C	A	B	C	A	B	C	D	A	B	C	D
MAX FILL OVER TOP	8	17	26	8	17	26	8	17	26	35	8	17	26	35
Conc Top Slab T_1	6¼	6¾	7½	6¼	6¾	7½	6¼	6¾	7½	8½	6¼	6¾	7½	8½
Conc Bottom Slab T_2	6¼	7¼	8½	6¼	7¼	8½	6¼	7¼	8½	9½	6¼	7½	8½	9½
Conc Sidewalls T_3	6	6	6	6	6	6	6	6	6	6	6	6	6	6
Reinforcing Steel "a" Size Bar #	5	4	5	5	4	5	5	4	5	5	5	4	5	5
"a" Spacing	10	11½	13	10	11½	13	10	11	13	11½	10	11	13	11½
"a" Length	17-9	17-8	17-9	17-9	17-8	17-9	17-5	17-8	17-9	17-9	17-9	17-8	17-9	17-9
"b" Size Bar #	5	5	6	5	5	6	5	5	6	6	5	5	6	6
"b" Spacing	10	11½	13	10	11½	13	10	11	13	11½	10	11	13	11½
"b" Length	17-3	17-3	17-3	17-3	17-3	17-3	17-3	17-3	17-3	17-5	17-3	17-3	17-3	17-5
"b1" Length	17-0	17-2	17-4	17-0	17-2	17-4	17-0	17-2	17-4	17-5	17-0	17-2	17-4	17-5
"c" Size Bar #	4	5	6	4	5	6	4	5	6	6	4	5	6	6
"c" Spacing	10	11½	13	10	11½	13	10	11	13	11½	10	11	13	11½
"c" Length	11-0	11-0	11-0	11-0	11-0	11-0	11-0	11-0	11-0	11-0	11-0	11-0	11-0	11-0
"d" Dist Bars Top Slab-Tot No	18	9	9	18	9	9	18	9	9	9	15	9	9	9
"d" Dist Bars Bottom Slab-Tot No	9	9	9	9	9	9	9	9	9	9	9	9	9	9
"e" Bars Size Bar #	4	4	4	4	4	4	4	4	4	5	4	4	4	6
"e" Bars Spacing	18	16	16	16	18	18	18	17	11½	11½	18	11	7	11½
Spacers Number	34			38			38				42			
Quan Concrete CY per lin ft	082	087	098	090	095	105	097	102	113	123	104	111	120	131
Quan Reinf Lbs per lin ft	150	126	153	155	130	157	157	136	161	181	161	143	171	192

SPAN	6'	6'	6'	6'	6'	6'	6'	6'	6'	6'	6'	6'	6'	6'
HEIGHT	3'	3'	3'	4'	4'	4'	5'	5'	5'	5'	6'	6'	6'	6'
STRENGTH CLASSIFICATION	A	B	C	A	B	C	A	B	C	D	A	B	C	D
MAX FILL OVER TOP	3	13	23	3	13	23	3	13	23	30	3	13	24	30
Conc Top Slab T_1	7½	7½	8¼	7½	7½	8¼	7½	7½	8¼	9¼	7½	7½	8¼	[illegible]
Conc Bottom Slab T_2	6	7¼	9¼	6	7¼	9¼	6	8	9¼	10	6	8	9¼	10¼
Conc Sidewalls T_3	6	6	6	6	6	6	6	6	6	6	6	6	6	6
Reinforcing Steel "a" Size Bar #	6	5	5	6	5	5	6	5	5	6	5	5	5	5
"a" Spacing	13	14	11½	13	14	11½	13	14	11½	10	13	14	11½	10
"a" Length	20-9	20-10	20-9	20-9	20-10	20-9	20-9	20-10	20-9	20-9	20-9	20-10	20-9	20-9
"b" Size Bar #	6	6	6	6	6	6	6	6	6	6	6	6	6	6
"b" Spacing	13	14	11½	13	14	11½	13	14	11½	10	13	14	11½	10
"b" Length	20-3	20-3	20-5	20-3	20-3	20-5	20-3	20-3	20-5	20-6	20-3	20-3	20-5	20-6
"b1" Length	20-0	20-2	20-5	20-0	20-2	20-5	20-0	20-3	20-5	20-6	20-0	20-0	20-5	[illegible]
"c" Size Bar #	4	6	6	4	6	6	4	6	6	6	4	6	6	6
"c" Spacing	13	14	11½	13	14	11½	13	14	11½	10	13	14	11½	10
"c" Length	13-0	13-0	13-0	13-0	13-0	13-0	13-0	13-0	13-0	13-0	13-0	13-0	13-0	13-0
"d" Dist Bars Top Slab-Tot No	18	9	9	18	9	9	18	9	9	9	18	9	9	9
"d" Dist Bars Bottom Slab-Tot No	9	9	9	9	9	9	9	9	9	9	9	9	9	9
"e" Bars Size Bar #	4	4	4	4	4	4	4	4	4	4	4	4	6	6
"e" Bars Spacing	18	18	18	16	18	11½	18	11½	12	10	18	6	12	10
Spacers Number	40			44			52				48			
Quan Concrete CY per lin ft	105	115	129	112	123	137	119	132	144	155	127	139	152	164
Quan Reinf Lbs per lin ft	[illegible]	168	196	183	170	206	167	177	209	235	192	187	222	249

SPAN	8'	8'	8'	8'	8'	8'	8'	8'	8'	8'	8'	8'	8'	8'	8'	8'	8'
HEIGHT	4'	4'	4'	5'	5'	5'	6'	6'	6'	7'	7'	7'	7'	8'	8'	8'	8'
STRENGTH CLASSIFICATION	A	B	C	A	B	C	A	B	C	A	B	C	D	A	B	C	D
MAX FILL OVER TOP	2	11	20	2	[illegible]	20	2	[illegible]	20	2	[illegible]	20	28	2	[illegible]	20	28
Conc Top Slab T_1	8¼	8¼	10¼	8¼	8¼	10¼	8¼	8¼	10¼	8¼	8¼	10¼	[illegible]	[illegible]	8¼	[illegible]	[illegible]
Conc Bottom Slab T_2	6½	9	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Conc Sidewalls T_3	6	6	6	6	6	6	6	6	6	6	6	6½	6	7	7	[illegible]	[illegible]
Reinforcing Steel "a" Size Bar #	6	5	5	6	5	5	6	5	5	6	5	5	6	[illegible]	5	5	6
"a" Spacing	11½	12	12	11½	12	12	11½	12	12	11½	12	12	10½	11½	11½	12	10½
"a" Length	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
"b" Size Bar #	6	6	7	6	6	7	6	6	7	6	6	7	[illegible]	6	6	[illegible]	[illegible]
"b" Spacing	11½	12	12	11½	12	12	11½	12	12	11½	12	12	10½	11½	11½	12	10½
"b" Length	26-5	26-5	26-7	26-5	26-5	26-7	26-5	26-5	26-7	26-5	26-5	26-9	27-3	26-9	26-9	27-1	[illegible]
"b1" Length	26-0	26-4	26-7	26-0	26-5	26-7	26-0	26-5	26-7	[illegible]	26-5	26-9	27-3	26-5	26-9	[illegible]	[illegible]
"c" Size Bar #	4	6	7	4	6	7	4	6	7	4	6	7	[illegible]	4	6	7	[illegible]
"c" Spacing	11½	12	12	11½	12	12	11½	12	12	11½	12	12	10½	11½	11½	12	[illegible]
"c" Length	17-0	17-0	17-0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
"d" Dist Bars Top Slab-Tot No	24	12	12	24	12	12	24	12	12	24	12	12	[illegible]	24	12	[illegible]	[illegible]
"d" Dist Bars Bottom Slab-Tot No	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
"e" Bars Size Bar #	4	4	4	4	4	5	4	4	6	4	6	[illegible]	[illegible]	4	6	[illegible]	[illegible]
"e" Bars Spacing	16	15	12	8	12	12	15	7	12	11½	12	12	10½	11½	[illegible]	[illegible]	[illegible]
Spacers Number	56			62			[illegible]			66				[illegible]			[illegible]
Quan Concrete CY per lin ft	147	167	195	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Quan Reinf Lbs per lin ft	261	280	301	266	[illegible]	[illegible]	[illegible]	264	320	276	277	336	409	283	295	447	441

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Note

For boxes of height less than that shown in table, use next greater table height slabs, wall dimensions and reinforcing steel, and make necessary changes in bar lengths, number of spacers and quantities. Number of "d" bars in table is slab total for all three cells

APPROVED JUNE 1, 1974

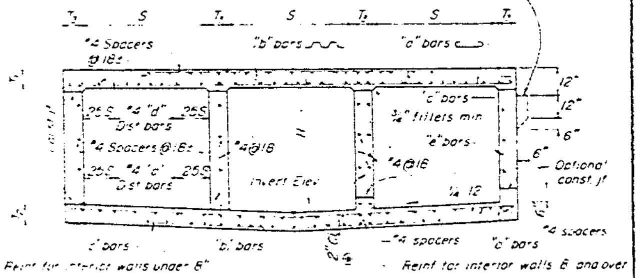
SPAN	10'	10'	10'	10'	10'	10'	10'	10'	10'	10'	10'	10'	10'	10'	10'	10'	10'
HEIGHT	5'	5'	5'	6'	6'	6'	7'	7'	7'	8'	8'	8'	8'	10'	10'	10'	10'
STRENGTH CLASSIFICATION	A	B	C	A	B	C	A	B	C	A	B	C	D	A	B	C	D
MAX FILL OVER TOP	2	11	20	2	11	20	2	11	20	2	11	20	28	2	11	20	28
Conc Top Slab T_1	9	10	12	9	10	12	9	10	12	9	10	12	14¼	9	10¼	12½	14¼
Conc Bottom Slab T_2	7½	10¾	13	7½	10¾	13	7½	10¾	13	7¼	11	13	15	8	11	13½	15
Conc Sidewalls T_3	6	6	6	6	6	6	6	6	6½	7	7	7½	8½	8	8½	9	10
Reinforcing Steel "a" Size Bar #	6	6	6	6	6	6	6	6	6	6	6	6	7	6	6	6	7
"a" Spacing	10½	13	10	10½	13	10	10½	13	10	10½	13	10	11	10½	13	10	11
"a" Length	32-10	32-10	32-10	32-10	32-10	32-10	32-10	32-10	32-10	33-0	33-2	33-2	33-4	33-8	33-6	33-6	33-10
"b" Size Bar #	6	7	7	6	7	7	6	7	7	6	7	7	8	6	7	7	8
"b" Spacing	10½	13	10	10½	13	10	10½	13	10	10½	13	10	11	10½	13	10	11
"b" Length	32-6	32-7	32-10	32-6	32-7	32-10	32-6	32-7	33-0	32-10	32-11	33-4	33-11	33-2	33-5	33-11	34-5
"b1" Length	32-2	32-7	32-11	32-2	32-7	32-11	32-2	32-7	33-1	32-6	32-11	33-5	33-11	[illegible]	33-5	33-11	34-5
"c" Size Bar #	5	7	7	5	7	7	5	7	7	5	7	7	8	5	7	7	8
"c" Spacing	10½	13	10	10½	13	10	10½	13	10	10½	13	10	11	10½	13	10	11
"c" Length	21-0	21-0	21-0	21-0	21-0	21-0	21-0	21-0	21-1	21-2	21-2	21-3	21-5	21-4	21-5	21-6	21-8
"d" Dist Bars Top Slab-Tot No	27	15	15	27	15	15	27	15	15	27	15	15	15	27	15	15	15
"d" Dist Bars Bottom Slab-Tot No	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15
"e" Bars Size Bar #	4	4	5	4	5	6	4	6	7	4	6	7	8	5	6	8	8
"e" Bars Spacing	18	13	10	18	13	10	13	13	10	10½	12	10	[illegible]	10½	9	10	9
Spacers Number	68			68			72			76			94	102			
Quan Concrete CY per lin ft	198	240	282	205	248	290	[illegible]	255	303	234	277	323	[illegible]	266	[illegible]	373	422
Quan Reinf Lbs per lin ft	358	372	470	359	379	482	367	[illegible]	502	377	402	514	[illegible]	[illegible]	[illegible]	577	632

SPAN	12'	12'	12'	12'	12'	12'	12'	12'	12'	12'	12'	12'	12'	12'	12'	12'	12'	12'	12'	12'	12'
HEIGHT	6'	6'	6'	7'	7'	7'	8'	8'	8'	9'	9'	9'	9'	10'	10'	10'	10'	12'	12'	12'	12'
STRENGTH CLASSIFICATION	A	B	C	A	B	C	A	B	C	A	B	C	D	A	B	C	D	A	B	C	D
MAX FILL OVER TOP	2	10	18	2	10	18	2	10	18	2	11	20	30	2	11	20	30	2	11	20	30
Conc Top Slab T_1	10¼	11½	14	10¼	11½	14	10¼	11½	14	10¼	12	14¾	17¾	10¼	12	14¾	17¾	10¼	12	14¾	17¾
Conc Bottom Slab T_2	8¼	12	14½	8½	12	14¾	8½	12	14¾	8¾	12½	15½	16¼	8¾	12½	15½	16¼	9	12¾	15¾	16¼
Conc Sidewalls T_3	6	6	6½	6	6	7	7	7	7½	8	8	9	10	8	8	9	10½	9	9	10½	12
Reinforcing Steel "a" Size Bar #	7	6	7	7	6	7	7	6	7	7	6	7	8	7	6	7	8	7	6	7	8
"a" Spacing	12	11	11½	12	11	11½	12	11	11½	12	10½	11	11½	12	10½	11	11½	12	10½	11	11½
"a" Length	39-1	38-10	39-3	39-[illegible]	38-10	39-5	39-5	39-2	39-7	39-9	39-6	40-[illegible]	40-10	39-9	39-6	40-1	41-0	40-1	39-10	40-7	41-6
"b" Size Bar #	7	7	8	7	7	8	7	7	8	7	7	8	9	7	7	8	9	7	7	8	9
"b" Spacing	12	11	11½	12	11	11½	12	11	11½	12	10½	11	11½	12	10½	11	11½	12	10½	11	11½
"b" Length	38-7	38-9	39-3	38-7	38-9	39-5	38-11	39-1	39-7	39-3	39-6	40-2	40-10	39-3	39-6	40-2	41-0	39-7	39-11	40-6	41-6
"b1" Length	38-3	38-7	39-2	38-3	38-9	39-5	38-7	39-1	39-7	39-0	39-6	40-2	40-10	39-0	39-6	40-2	41-0	39-4	39-10	40-9	41-6
"c" Size Bar #	6	7	8	6	7	8	6	7	8	6	7	8	9	6	7	8	9	6	7	8	9
"c" Spacing	12	11	11½	12	11	11½	12	11	11½	12	10½	11	11½	12	10½	11	11½	12	10½	11	11½
"c" Length	25-0	25-0	25-[illegible]	25-0	25-0	25-2	25-2	25-2	25-3	25-4	25-4	25-6	25-8	25-4	25-5	25-6	25-9	25-6	25-6	25-9	25-10
"d" Dist Bars Top Slab-Tot No	36	15	15	36	15	15	36	15	15	36	15	15	15	36	15	15	15	36	15	15	15
"d" Dist Bars Bottom Slab-Tot No	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15
"e" Bars Size Bar #	4	4	6	4	4	6	4	4	6	4	6	7	8	5	7	6	8	6	7	[illegible]	9
"e" Bars Spacing	18	7	11½	12	5¾	11½	12	5½	9	10	10½	11	11½	12	10½	11	6½	12	9	11	9
Spacers Number	76			80			84			104				110				116			
Quan Concrete CY per lin ft	260	3[illegible]8	282	270	326	398	288	345	4[illegible]3	3[illegible]3	379	46[illegible]	545	327	36[illegible]	472	565	362	428	524	618
Quan Reinf Lbs per lin ft	489	50[illegible]	628	497	515	637	505	527	654	536	582	7[illegible]9	872	546	606	745	939	575	636	794	96[illegible]

① For reinforcement clearance, except at bottom, see "Miscellaneous Details"

For exposed top extend "c" bars full length, provide additional #4 spacers @ 18± and adjust quantities

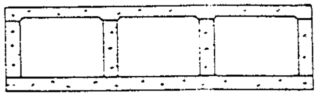
Provide paving notch when top is exposed and where PCC pavement or approach slab is used.



Reinf for interior walls under 6"

Reinf for interior walls 6" and over

TYPICAL SECTION



"FLAT INVERT" ALTERNATIVE

(When shown)

STATE OF CALIFORNIA
BUSINESS AND TRANSPORTATION AGENCY
DEPARTMENT OF TRANSPORTATION

TRIPLE BOX CULVERT

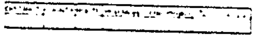
D82-2

D82-2

6/74 Rev spacers at 6 span table

SPAN	4'											5'													
HEIGHT	2'			3'				4'				2'			3'			4'				5'			
STRENGTH CLASSIFICATION	A	B	C	A	B	C	D	A	B	C	D	A	B	C	A	B	C	A	B	C	D	A	B	C	D
MAX FILL OVER TOP	11	21	32	11	23	34	46	11	23	34	46	6	24	36	6	24	36	6	23	34	46	6	23	34	46
Conc. Top Slab T1	6½	6½	7¼	6½	6½	7½	8½	6½	6½	7½	8½	6¾	7¾	9¼	6¾	7¾	9¼	6¾	7¾	9	10¼	6¾	7¾	9¼	10¼
Conc. Bottom Slab T2	6	7¼	8½	6	7½	8½	9½	6	7½	8½	9½	6½	8¾	10¼	6½	8¾	10¼	6½	8¾	10	11¼	6½	8¾	10	11¼
Conc. Sidewalls T3	6	6	6	6	6	6	6	6	6	6	6	6	6	6	5	5	6	6	6	6	6	6	6	6	6
Reinforcing Steel "a" Size Bar #	5	4	4	5	4	4	4	5	4	4	4	5	4	4	5	4	4	5	4	4	4	5	4	4	4
"a" Spacing	11	11	9	11	10½	8½	7½	11	10½	8½	7½	10	8½	10	10	8½	10	10	8½	10	9	10	8½	10½	9
"a" Length	10-3	10-2	10-2	10-3	10-2	10-2	10-2	10-3	10-2	10-2	10-2	12-3	12-2	12-2	12-3	12-2	12-2	12-3	12-2	12-2	12-2	12-3	12-2	12-2	12-2
"b" or "b1" Size Bar #	5	5	5	5	5	5	5	5	5	5	5	5	5	6	5	5	6	5	5	6	6	5	5	6	6
"b" or "b1" Spacing	11	11	9	11	10½	8½	7½	11	10½	8½	7½	10	8½	10	10	8½	10	10	8½	10	9	10	8½	10½	9
Length "b"	9-4	9-4	9-6	9-4	9-4	9-6	9-7	9-4	9-4	9-6	9-7	11-5	11-6	11-7	11-5	11-6	11-7	11-5	11-6	11-7	11-8	11-5	11-6	11-7	11-6
Length "b1"	9-4	9-5	9-6	9-4	9-5	9-6	9-7	9-4	9-5	9-6	9-7	11-4	11-6	11-7	11-4	11-6	11-7	11-4	11-5	11-7	11-8	11-4	11-6	11-7	11-8
"c" Size Bar #	4	5	5	4	5	5	5	4	5	5	5	4	5	5	4	5	6	4	5	6	6	4	5	6	6
"c" Spacing	11	11	9	11	10½	8½	7½	11	10½	8½	7½	10	8½	10	10	8½	10	10	8½	10	9	10	8½	10½	9
"c" Length	4-6	4-6	4-6	4-6	4-6	4-5	4-6	4-6	4-6	4-6	4-6	5-6	5-6	5-6	5-6	5-6	5-6	5-6	5-6	5-6	5-6	5-6	5-6	5-6	5-6
"d" Dist Bars Top Slab-Tot No	10	6	6	10	6	6	6	10	6	6	6	12	6	6	12	6	6	12	6	6	6	12	6	6	5
"d" Dist Bars Bottom Slab-Tot No	6	6	5	6	6	6	6	6	6	6	6	6	5	6	6	6	6	5	6	6	6	6	6	6	6
"e" Bars Size Bar #	4	4	4	4	4	4	4	4	4	4	5	4	4	4	4	4	4	4	4	4	5	4	4	5	6
"e" Bars Spacing	18	18	18	18	18	16	12	18	12	9	10	18	18	18	18	18	16	18	12	10	10½	18	8½	9	9
Spacers Number	23			25				29				23			25			29				32			
Quan. Concrete C.Y. per lin ft	047	051	057	053	057	063	069	059	063	069	075	058	069	080	063	075	086	069	080	089	098	074	086	097	104
Quan. Reinf Lbs per lin ft	81	74	84	84	79	91	101	87	85	99	111	99	100	109	103	104	112	105	109	119	133	109	116	126	145

SPAN	6'														8'																
HEIGHT	3'			4'			5'				6'				4'			5'			6'			7'				8'			
STRENGTH CLASSIFICATION	A	B	C	A	B	C	A	B	C	D	A	B	C	D	A	B	C	A	B	C	A	B	C	A	B	C	D	A	B	C	D
MAX FILL OVER TOP	4	20	34	4	22	34	4	19	33	43	4	19	33	43	3	14	25	3	14	25	3	14	25	3	14	25	37	3	14	25	37
Conc. Top Slab T1	7¼	8¼	10½	7¼	8¼	10½	7¼	8¼	10½	12	7¼	8¼	10½	12	8½	9½	12	8½	9½	12	8½	9½	12	8½	9½	12¼	14¼	8½	9½	12¼	14¼
Conc. Bottom Slab T2	7¼	9½	11½	7¼	9½	11½	7¼	9½	11½	12¾	7¼	9½	11½	12¾	7½	10¾	12¾	7½	10¾	12¾	7½	10¾	12¾	7½	10¾	13	15	7½	10¾	13	15¼
Conc. Sidewalls T3	5	6	6	6	6	6	6	6	6	6	6	5	6	7	6	6	6	6	5	6	6	5	6	7	7	7	8	7	7	8	8½
Reinforcing Steel "a" Size Bar #	5	4	4	5	4	4	5	4	4	4	5	4	4	4	6	4	4	6	4	4	6	4	4	6	4	4	4	6	4	4	4
"a" Spacing	9½	11	8½	9½	11	8½	9½	11	8½	10½	9½	11	8½	10½	12	9½	10½	12	9½	10	12	9½	10	11½	9½	10	8½	11½	9½	10	8½
"a" Length	14-3	14-2	14-2	14-3	14-2	14-2	14-3	14-2	14-2	14-2	14-3	14-2	14-2	14-8	18-4	18-2	18-2	18-4	18-2	18-2	18-4	18-2	18-2	18-7	18-5	18-5	18-8	18-7	18-5	18-8	18-10
"b" or "b1" Size Bar #	5	6	6	5	5	6	5	6	6	7	5	6	6	7	5	6	7	6	6	7	6	6	7	6	6	7	7	6	6	7	7
"b" or "b1" Spacing	9½	11	8½	9½	11	8½	9½	11	8½	10½	9½	11	8½	10½	12	9½	10½	12	9½	10	12	9½	10	11½	9½	10	8½	11½	9½	10	8½
Length "b"	13-6	13-6	13-8	13-6	13-6	13-6	13-6	13-6	13-8	13-9	13-6	13-6	13-8	14-2	17-7	17-8	17-9	17-7	17-8	17-9	17-7	17-8	17-9	17-10	17-10	18-0	18-5	17-10	17-10	18-5	18-6
Length "b1"	13-5	13-7	13-8	13-5	13-7	13-8	13-5	13-6	13-8	13-9	13-5	13-6	13-8	14-2	17-5	17-8	17-9	17-5	17-8	17-9	17-5	17-8	17-9	17-8	17-11	18-0	18-5	17-8	17-11	18-0	18-7
"c" Size Bar #	4	6	6	4	6	6	4	5	5	7	4	6	6	7	4	5	7	4	5	7	4	5	7	4	6	7	7	4	6	7	7
"c" Spacing	9½	11	8½	9½	11	8½	9½	11	8½	10½	9½	11	8½	10½	12	9½	10½	12	9½	10	12	9½	10	11½	9½	10	8½	11½	9½	10	8½
"c" Length	6-6	6-6	6-6	5-6	6-6	6-5	5-5	6-6	5-6	6-6	5-5	5-6	5-5	5-6	8-6	8-6	8-6	8-6	8-6	8-6	8-6	8-6	8-6	8-7	8-7	8-7	8-8	8-7	8-7	8-8	8-9
"d" Dist Bars Top Slab-Tot No	12	6	6	12	6	6	12	5	6	6	12	6	5	5	16	8	8	16	8	8	16	8	8	16	8	8	8	16	8	8	8
"d" Dist Bars Bottom Slab-Tot No	6	6	6	5	5	6	6	6	6	6	6	6	6	6	6	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
"e" Bars Size Bar #	4	4	4	4	4	4	4	4	5	5	4	5	6	6	4	4	4	4	4	5	4	5	5	4	5	6	7	4	5	7	7
"e" Bars Spacing	18	18	16	18	14	9½	18	10	9½	7	18	11	9	6	18	9	10½	18	12	10	18	[illegible]	10	14	9½	[illegible]	[illegible]	[illegible]	8½	7½	8
Spacers Number	30			33			35				36				41			44			44			47		55		53		60	
Quan. Concrete C.Y. per lin ft	077	090	108	082	096	113	088	101	119	130	093	107	125	147	108	130	155	[illegible]	137	[illegible]	[illegible]	142	166	132	156	183	214	139	162	199	227
Quan. Reinf Lbs per lin ft	121	119	127	125	124	144	128	131	164	175	129	137	177	201	159	175	200	177	[illegible]	218	[illegible]	188	229	185	194	248	299	191	207	284	314



REGISTERED CIVIL ENGINEER No. [illegible]

APPROVED JUNE 1, 1974

Note

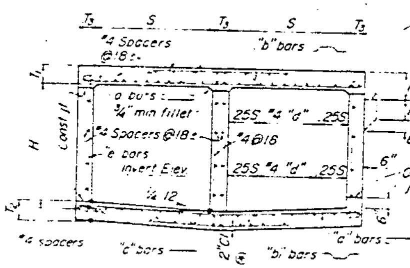
For boxes of height less than that shown in table, use next greater table height slabs, wall dimensions and reinforcing steel, and make necessary changes in bar lengths, number of spacers and quantities.

*Number of "d" bars in table is slab total for both cells

SPAN	10'																	12'																					
HEIGHT	5'			6'			7'			8'				10'				6'			7'			8'			9'				10'				12'			
STRENGTH CLASSIFICATION	A	B	C	A	B	C	A	B	C	A	B	C	D	A	B	C	D	A	B	C	A	B	C	A	B	C	A	B	C	D	A	B	C	D	A	B	C	D
MAX. FILL OVER TOP	2	17	30	2	17	30	2	17	30	2	16	29	36	2	16	29	36	2	14	26	2	14	25	2	14	25	2	14	26	35	2	14	26	36	2	14	26	36
Conc. Top Slab T1	8¾	12¾	16	8¾	12¾	16	8¾	12¾	16	8¾	12¾	15	17¼	8¾	12¾	16	17½	10	14	17½	10	14¼	17½	10¼	14¼	17¾	10¼	14½	17¾	20¼	10¼	14½	17¾	20½	10¼	14½	18¼	21¼
Conc. Bottom Slab T2	8¾	13½	16½	8¾	13½	16½	8¾	13¾	16¾	8¾	13½	16½	18¼	8¾	13½	16½	18½	9¼	14¾	18	9¼	15	18¼	9¾	15	18½	10	15¼	18¾	21¼	10¼	15¼	18¾	21½	10½	15¼	19¼	22
Conc. Sidewalls T3	6	6	6	6	6	6	6	6½	7	7	7	7½	8½	8	8	9	10	6	6	6½	7	7	7	8	8	8½	9	9	9	10	9	9	9½	11	9	10	11	12
Reinforcing Steel "a" Size Bar #	6	4	4	6	4	4	6	4	4	6	4	4	4	6	4	4	4	6	4	4	6	4	4	6	4	4	6	4	4	4	6	4	4	4	6	4	4	4
"a" Spacing	11	10	10	11	9½	10	11	9½	10	11	10	10	9	11	10	10	9	9	11½	9	9	11½	9	9	11	8½	9	11	8½	9	9	11	8½	9	9	11	8½	9
"a" Length	22-4	22-2	22-2	22-4	22-2	22-2	22-4	22-4	22-5	22-7	22-5	22-7	22-10	22-10	22-8	22-11	23-2	25-4	25-2	25-4	26-7	25-5	25-5	26-10	26-8	26-10	27-1	26-11	26-11	27-1	27-1	[illegible]	27-3	27-5	27-1	27-2	27-5	27-8
"b" or "b1" Size Bar #	6	7	8	6	7	8	6	7	8	6	7	8	8	6	7	8	8	6	8	8	6	8	8	6	8	8	6	8	8	9	5	8	8	9	6	8	8	9
"b" or "b1" Spacing	11	10	10	11	9½	10	11	9½	10	11	10	10	9	11	10	10	9	9	11½	9	9	11½	9	9	11	8½	9	11	8½	9	9	11	8½	9	9	11	8½	9
Length "b"	21-7	24-0	22-0	21-7	21-0	22-0	21-7	21-11	22-3	21-10	22-1	22-4	22-9	22-1	22-4	22-9	23-1	25-8	25-10	26-3	25-11	26-1	26-4	25-2	25-4	25-9	26-5	26-8	26-10	27-4	26-5	26-8	27-2	27-6	26-5	26-11	27-5	27-10
Length "b1"	21-5	21-0	22-0	21-5	21-0	22-0	21-5	21-11	22-3	21-9	22-0	22-4	22-9	22-0	22-3	22-8	23-2	25-6	25-10	26-3	25-9	26-2	26-4	25-1	25-5	25-9	26-4	26-8	26-11	27-4	26-4	26-8	27-2	27-7	26-4	26-11	27-5	27-11
"c" Size Bar #	6	7	8	6	7	8	6	7	8	6	7	8	8	6	7	8	8	5	8	8	5	8	8	5	8	8	5	8	8	9	5	8	8	9	5	8	8	9
"c" Spacing	11	10	10	11	9½	10	11	9½	10	11	10	10	9	11	10	10	9	9	11½	9	9	11½	9	9	11	8½	9	11	8½	9	9	11	8½	9	9	11	8½	9
"c" Length	10-6	10-6	10-6	10-6	10-6	10-6	10-6	10-7	10-7	10-7	10-7	10-8	10-9	10-8	10-8	10-9	10-10	12-6	12-6	12-7	12-7	12-7	12-7	12-8	12-8	12-9	12-9	12-9	12-9	12-10	12-9	12-9	12-10	12-11	12-9	12-10	12-11	13-0
"d" Dist Bars Top Slab-Tot No	18	10	10	18	10	10	18	10	10	18	10	10	10	18	10	10	10	24	10	10	24	10	10	24	10	10	24	10	10	10	24	10	10	10	24	10	10	10
"d" Dist Bars Bottom Slab-Tot No	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10
"e" Bars Size Bar #	4	4	5	4	4	5	4	4	5	4	5	6	7	4	6	6	7	4	4	5	4	4	5	4	4	5	4	5	7	8	4	7	8	8	6	7	8	9
"e" Bars Spacing	18	10	10	18	5	6½	14	6	8	11	8½	6	6	7½	7	5½	5	18	9	8	15	6	5½	12	5¼	6	9	7½	8½	6	6½	11	8½	9	12	8	7	7
Spacers Number	48			48			51			54		64		68				52			55			58			68				72				76			
Quan. Concrete C.Y. per lin ft	140	205	246	145	207	248	151	218	264	166	227	274	304	192	251	305	341	184	259	316	197	277	328	219	293	357	239	315	369	425	248	323	386	449	257	353	430	492
Quan. Reinf Lbs per lin ft	236	254	310	238	274	324	243	280	339	252	278	355	430	279	327	400	475	309	317	401	316	330	415	335	363	460	345	374	465	578	35[illegible]	394	519	562	371	427	557	673

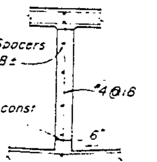
For reinforcement clearance, except at bottom, see "Miscellaneous Details"

For exposed top, extend "c" bars full length, top slab only, provide additional #4 spacers @18± and adjust quantities.

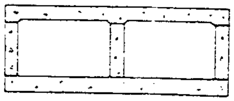


TYPICAL SECTION

(Showing reinforcement for interior walls 8" and over)



Reinforcement for interior walls under 8"



"FLAT INVERT" ALTERNATIVE

(When shown)

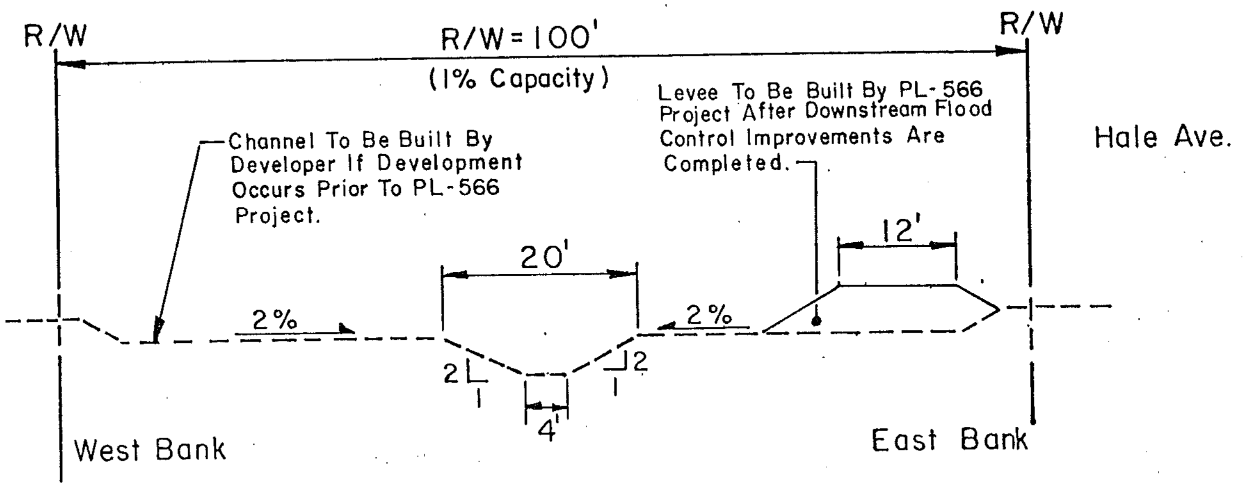
STATE OF CALIFORNIA
BUSINESS AND TRANSPORTATION AGENCY
DEPARTMENT OF TRANSPORTATION

DOUBLE BOX CULVERT D81-2

Reach 8b

Reach 8b extends from station 195+15 to 206+65 on West Little Llagas Creek. This is a trapezoidal earth channel with a 1% event capacity.

WEST LITTLE LLAGAS CREEK


R/W
R/W=100'
(1% Capacity)
R/W
Levee To Be Built By PL-566 Project After Downstream Flood Control Improvements Are Completed.
Hale Ave.
Channel To Be Built By Developer If Development Occurs Prior To PL-566 Project.
12'
20'
2%
2%
2
1
2
1
4'
West Bank
East Bank

STA 195+15 (Wright Ave.) To STA 206+65 (1500' u/s Of Wright Ave.)

WRIGHT AVE TO STA 206+65 (ALONG HALE AVE.)

REACH 8b

FIGURE 10

178

LLAGAS CREEK - SUPPLEMENTAL MODIFIED WORK PLAN

ESTIMATE OF CHANNEL COSTS

REACH NO. 8B sta 195+15 to 1000 u/s

Item	Quantity	Unit Cost	$
Channel Excavation	2,780	2.80	7784
Compacted Embankment			
Drop Structures			
Drainage Inlets			
Riprap			
Filter Stone			
S[illegible]ing			
Landscaping		1%	84
Structural Excavation			
Rectangular Concrete Channel			
Compacted Backfill			
Levee Embankment			
Site Preparation (Levees)	1,72	350 ac	602
Mobilization		6%	508 ~~503~~

Subtotal 8978 ~~8889~~

10/12
~~15~~% Contingency 1077 ~~1067~~

TOTAL ~~9956~~
10055

LLAGAS CREEK - SUPPLEMENTAL MODIFIED WORK PLAN

ESTIMATE OF OTHER CONSTRUCTION COSTS

REACH NO. 8B

Item	Quantity	Unit Cost	$
State and County Bridges			
~~Private Bridges~~ fence	~~2000~~	~~6~~	~~12,000~~
RCB Culverts			
Relocation of Utilities			

Subtotal ~~12,000~~

~~15~~ 12% Contingency ~~1440~~

TOTAL ~~13440~~

no fencing for cost F

ESTIMATED COST OF LAND PURCHASE

Item	Quantity	Unit Cost	$
Creek Bottom			
Agricultural			
Potential Residential (low value)			
Potential Residential (medium value)	1.72	20000	34400
Residential/School			
Dwellings			

TOTAL 34400

~~Total 52,095~~

Calif

LL Hansen 7/22/81

Reach 8 b

195+15 — 227+35

Upper Llagas

Aged

```
WP PROG     1
  DATA
     640.      Q1
      4.9      D
      12.      B
       2.      Z
    0.0045     S
     0.035     N
     RUN
      31.6     T
    106.82     A
3.149781253    R
653.7271541    Q2
6.119894721    V
 Q1/Q2 RATIO
.9790017073
     END
```

Built

```
WP PROG     1
  DATA
     400.      Q1
      3.2      D
      12.      B
       2.      Z
    0.0045     S
     0.025     N
     RUN
      24.8     T
     58.88     A
2.237861317    R
401.6751568    Q2
6.821928614    V
 Q1/Q2 RATIO
.9958295734
     END
```

LLAGAS CREEK - REACH 2B

4/6/81

1/181

~~$K'_c = \frac{Q}{b^{5/2}} = \frac{500}{561} =$ [illegible]~~

~~$\frac{D_c}{b} = 0.32 \quad D_c = 4.1$~~

check [illegible] at Wright ave

$S = .002 \quad b = 12$

$$K' = \frac{Qn}{b^{8/3} S^{1/2}} = \frac{(500)(.015)}{(753.3)(.045)} = 0.22$$

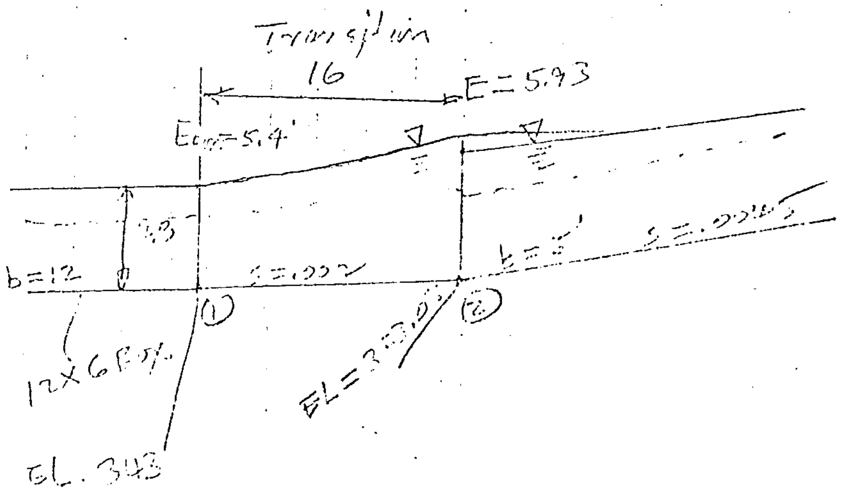
$$\frac{D_n}{b} = 0.360 \quad D_n = 4.3 \qquad V = \frac{Q}{A} = \frac{500}{80.6} = 6.2$$

$$E_m = 5.4'$$

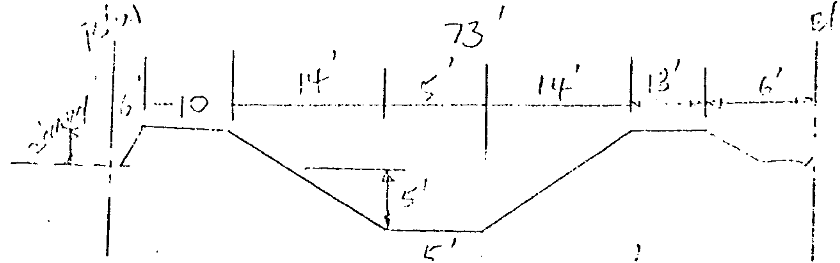
$$K'_c = \frac{Q}{b^{5/2}} = \frac{500}{498.8} = 1.00$$

$$\frac{D_c}{b} = 0.32 \quad D_c = 3.84 \qquad V_c = \text{[illegible]} = 6.62$$

$$E_c = 4.51$$



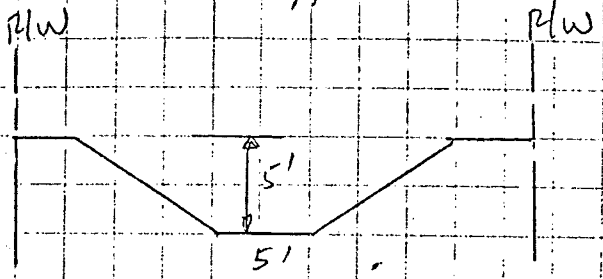
R/W width for the Earth Channel



```
 1  1  1     16.00  .00  .00        .00 329.94  .00   700 .0149  4.80  3.90   76.80   9.11
rror
~~       1   13.00  .00  .00       7.00 329.96  .10   700 .0149 -3.27  4.48   54.35  12.87~~
  1  1  1 ① 12.00  .00  .00         .00 343.00  .00   500 .0149  4.80  3.76   57.60   8.68
       1  ②  5.00 2.00 2.00       16.00 343.03  .25   500 .0149  5.68  4.15   93.14   5.36
```

LLAGAS CREEK - REACH 8B 1/6/81 TJ 183

Quantities take-off



Excavation

$2.78 \text{ C.Y/l.f.} \times 1000 = \boxed{2780 \text{ C.Y}}$

~~Fence: 2000 l.f.~~ Void

R/W $75' \times 1000 \times \frac{1}{43560} = \boxed{1.72 \text{ AC}}$

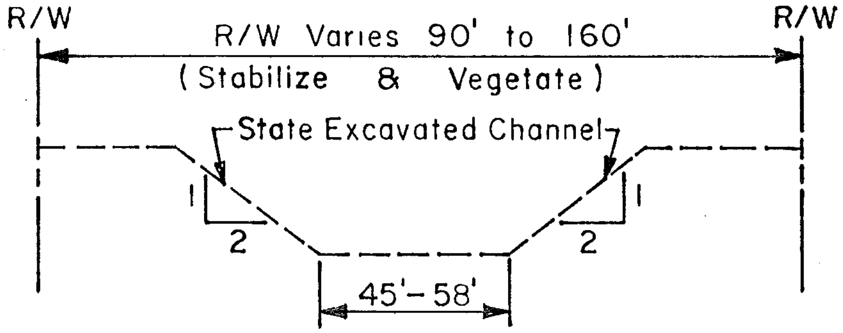
Clearing $\boxed{1.72 \text{ AC}}$ light clearing

R/W width see 8A Calculation 1.72 ac

Reach 14

This reach extends from station 0+00 to 180+50 on East Little Llagas Creek. The trapezoidal earth channel was excavated to rough grade in 1972 by CalTrans. The proposed work is to stabilize the sides and bottom. Four drop structures are to be installed. The bridges at Church and at San Martin have already been installed as part of the project.

EAST LITTLE LLAGAS CREEK



Sta. 0+00 (Conflu. w/ Main Branch) to Sta. 180+50 (South Valley Freeway)

CONFLUENCE WITH MAIN BRANCH TO SOUTH VALLEY FWY.

REACH 14

FIGURE 17

Calc
L L Hansen 7/29/81
Reach 14

Upper Llagas

Cost Summary

Drops Structures	1354 cy @ 350	473900
Rock Lining	730 cy @ 40	29200
Land scape		26880
Veg (erosion) seed		19500
		549480
Mobilization	3%	16484
		565964
Contingency	12%	67916
		633,880
**R/W		—
***Bridges		156,000

*

** previously purchased R/W (no cost to District by Cal Trans
*** previously constructed bridges at (Church) and (San Martin)

Calif
LL Hansen 7/29/81
Reach 14

Upper Llagas

Drop Structures

4 structures

Sta	Q	Drop	Concrete
0+00	3830	1.8	360
27+00	3580	5.8	400
83+00	2930	4	297
113+00	2930	4	297
			1354 cy

extrapolated on DMUM curve

add 20% or 27+00 & 10% 83+00 & 113+00 for extra height of D above curve OK

LLAGAS CREEK - No Flood control Work (existing)

Reach 14 cohesive soil (work plans)

4 drop structures.

488 C.Y./ea X 4X 350 = 512,400 | 683,200

Rock lining

(730 c.y)(40) = | 29,20

712,40

Calif
LL Hansen 7/22/81
Reach 14

Aged ≈ As Built

0+00 - 6+00

```
WP PROG     1
    DATA
     3830.        Q1
        8.4        D
        58.        B
         2.        Z
    0.0017         S
      0.035        N
      RUN
       91.6        T
     628.32        A
6.574727217        R
3860.183371       Q2
6.143658281        V
 Q1/Q2 RATIO
.9921808452
       END
```

6+00 - 52+00

```
WP PROG     1
    DATA
     3580.        Q1
        8.6        D
        45.        B
         2.        Z
    0.0021         S
      0.035        N
      RUN
       79.4        T
     534.92        A
6.409269514        R
3591.051261       Q2
6.713249198        V
 Q1/Q2 RATIO
.9969225555
       END
```

Calif
L L Hansen 7/22/81
Reach 14

Upper Wagas

52+00 — 121+50

Aged = As Built

```
 WP PROG      1
    DATA
     2930.       Q1
       7.1        D
       50.        B
        2.        Z
    0.0023        S
     0.035        N
     RUN
      78.4        T
    455.82        A
5.575632137       R
 2918.35062      Q2
6.402418982       V
 Q1/Q2 RATIO
1.003991768
     END
```

121+50 — 180+50

```
 WP PROG      1
    DATA
     1450.       Q1
       8.3        D
       12.        B
        2.        Z
    0.0025        S
     0.035        N
     RUN
      45.2        T
    237.38        A
 4.83277983       R
1440.443523      Q2
6.068091342       V
 Q1/Q2 RATIO
1.006634399
     END
```

Calif
LLH 6/26/81
Reach 14

Upper Llagas Creek Watershed

Drop structures

4 drop structures used

locations ~~0+00~~ 2+00
~~32+00~~ 32+50
~~85+00~~ 89+00 from plans
~~115+00~~ 108+50

Q = 4000 cfs max at Sta. 0+00

From DMJM Report see tables in Reach 5

5000 cfs $Vol_{conc} = 488$ cy/structure

3000 cfs $Vol_{conc.} = 270$ cy/structure

assume straight line interpolation

Then $Vol_{conc} = \frac{488+270}{2} = \underline{\underline{379}}$ cy

this is adequate since all other Q's are less than 4000 cfs and most near 3000 cfs

Cost = 379 (350) = $\$\underline{\underline{132,6}}50(4) = 530600$

Calif
LH 6/26/81
Reach 14

Upper Llagas Creek Watershed

Vegetation

Trees & shrubs
Tank Truck irrigation 8.4ac @3200 = 26880

Erosion control

Bank Tops and side slopes — Trees & Shrubs

$T = 18'$
$S = 2:1$
$d_{ave} = 7.0'$

$$A_{Gross} = \frac{(18)2 + 2(2.24)(7)}{43560}(18050) = 27.9\text{ ac}$$

$$A_{erosion} = 27.9 - 8.4 = 19.5\text{ ac}$$

$$\text{Cost} = 19.5(1000) \qquad 19500$$

$46380

Original calculation
712400(.03) $21 372

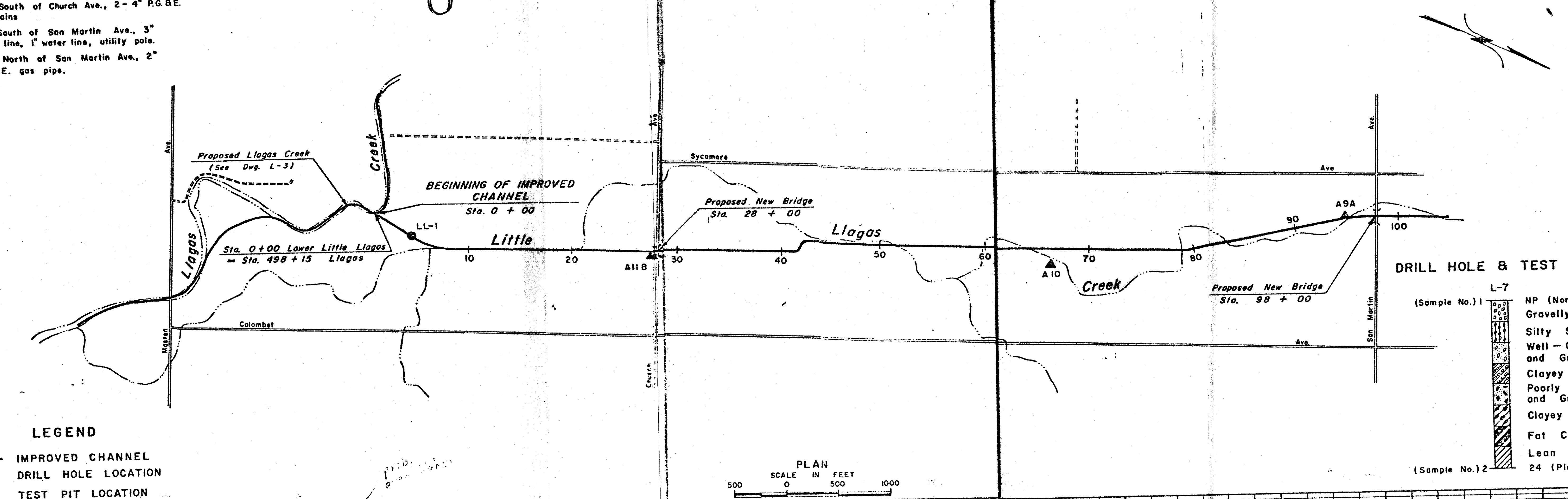
Because of the difference in previously calculated drop structure cost and present cost there is adequate funds to absorb the additional vegetation cost.

Previous total cost ok

194

TABLE OF UTILITES TO BE RELOCATED

1. 20'± South of Church Ave., 2 - 4" P.G.&E. gas mains
2. 15'± South of San Martin Ave., 3" water line, 1" water line, utility pole.
3. 50'± North of San Martin Ave., 2" P.G.&E. gas pipe.



LEGEND

- IMPROVED CHANNEL
- ▲ DRILL HOLE LOCATION
- ● TEST PIT LOCATION

DRILL HOLE & TEST PIT LEGEND

L-7

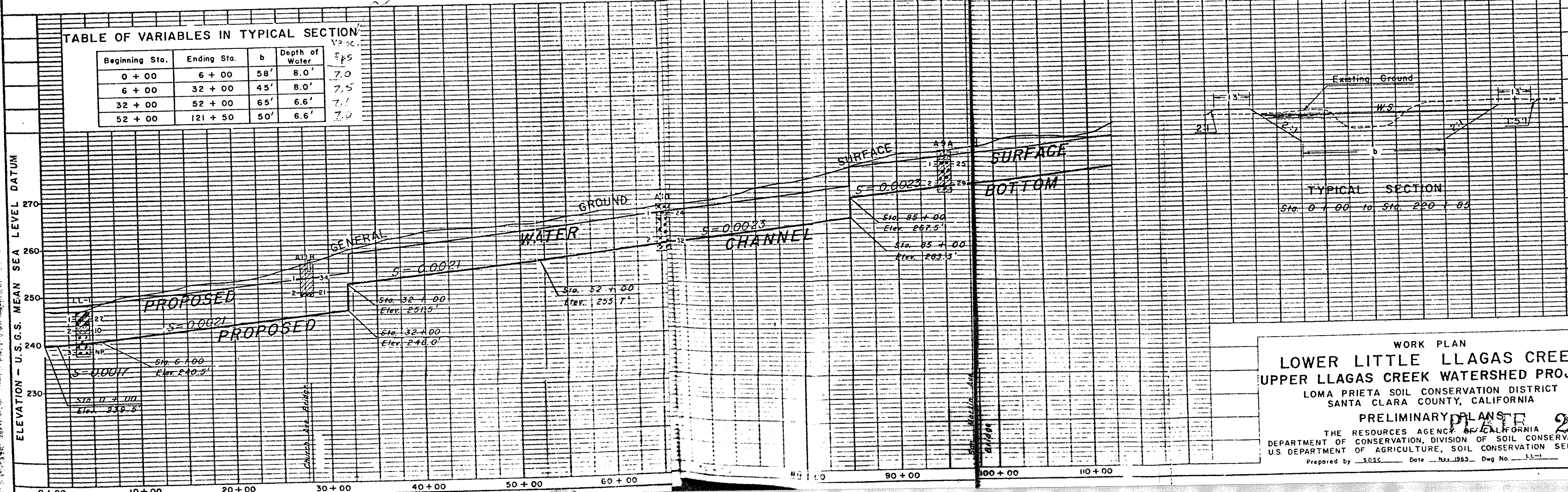
(Sample No.) 1

- NP (Non-Plastic)
- Gravelly Sand, SW
- Silty Sand, SM
- Well-Graded Sand and Gravel, GW
- Clayey Sand, SC
- Poorly Graded Sand and Gravel, GP
- Clayey Gravel, GC
- Fat Clay, CH
- Lean Clay, CL
- 24 (Plasticity Index)

(Sample No.) 2

TABLE OF VARIABLES IN TYPICAL SECTION

Beginning Sta.	Ending Sta.	b	Depth of Water	Veloc. fps
0 + 00	6 + 00	58'	8.0'	7.0
6 + 00	32 + 00	45'	8.0'	7.5
32 + 00	52 + 00	65'	6.6'	7.1
52 + 00	121 + 50	50'	6.6'	7.0



WORK PLAN

LOWER LITTLE LLAGAS CREEK

UPPER LLAGAS CREEK WATERSHED PROJECT

LOMA PRIETA SOIL CONSERVATION DISTRICT
SANTA CLARA COUNTY, CALIFORNIA

PRELIMINARY PLANS

PLATE 24

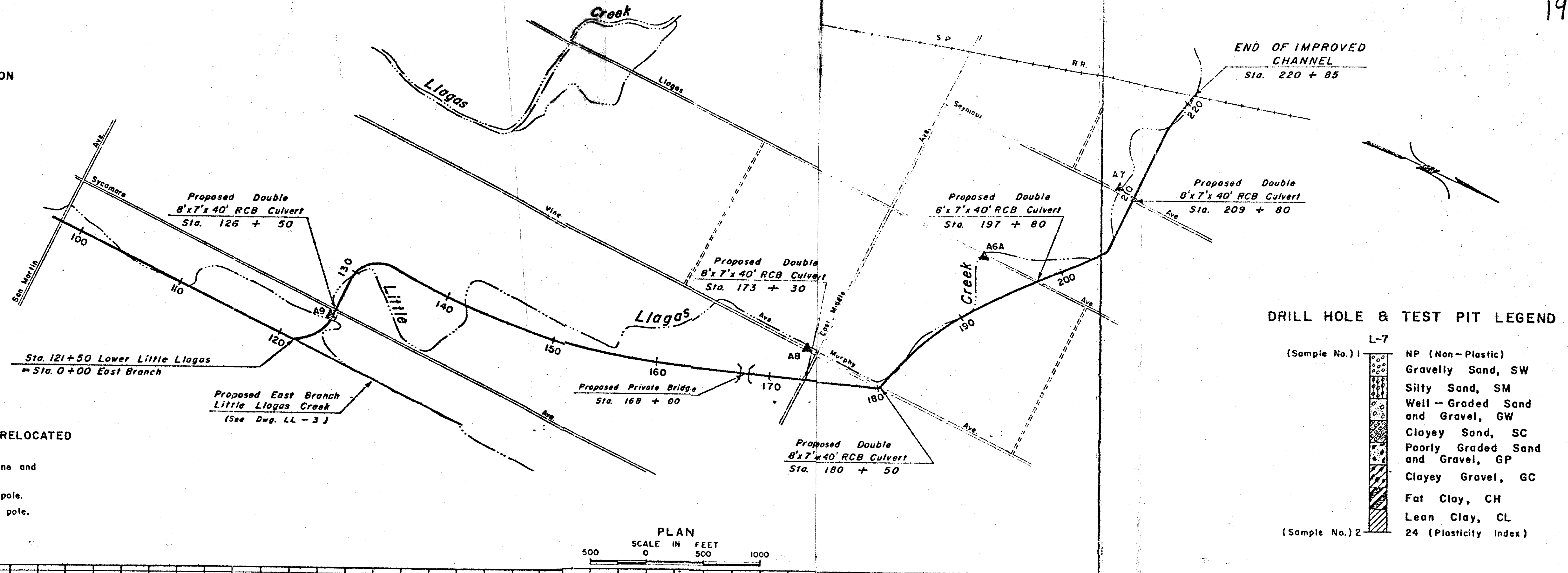
THE RESOURCES AGENCY OF CALIFORNIA
DEPARTMENT OF CONSERVATION, DIVISION OF SOIL CONSERVATION
U.S. DEPARTMENT OF AGRICULTURE, SOIL CONSERVATION SERVICE

Prepared by SOSC Date Nov 1965 Dwg No. LL-1

195.

LEGEND

- IMPROVED CHANNEL
- ▲ DRILL HOLE LOCATION
- ● TEST PIT LOCATION



Creek
Llagas
SP
RR.
Llagas
Seymour
Ave.
Sycamore
Ave.
San Martin
Vine
Middle
Ave.
East
Murphy
Ave.
Little
Llagas
Creek
END OF IMPROVED CHANNEL Sta. 220 + 85
Proposed Double 8'x7'x40' RCB Culvert Sta. 126 + 50
Proposed Double 8'x7'x40' RCB Culvert Sta. 173 + 30
Proposed Double 6'x7'x40' RCB Culvert Sta. 197 + 80
Proposed Double 8'x7'x40' RCB Culvert Sta. 209 + 80
Proposed Double 8'x7'x40' RCB Culvert Sta. 180 + 50
Proposed Private Bridge Sta. 168 + 00
Sta. 121+50 Lower Little Llagas = Sta. 0+00 East Branch
Proposed East Branch Little Llagas Creek (See Dwg. LL – 3)
A9
A8
A6A
A7
100
110
120
130
140
150
160
170
180
190
200
210
220
PLAN
SCALE IN FEET
500 0 500 1000

TABLE OF UTILITIES TO BE RELOCATED

1. Sta. 139± 4" irrigation line.
2. South of Middle Ave., water line and utility pole.
3. East of Murphy Ave., utility pole.
4. West of Llagas Ave., utility pole.

DRILL HOLE & TEST PIT LEGEND

L-7

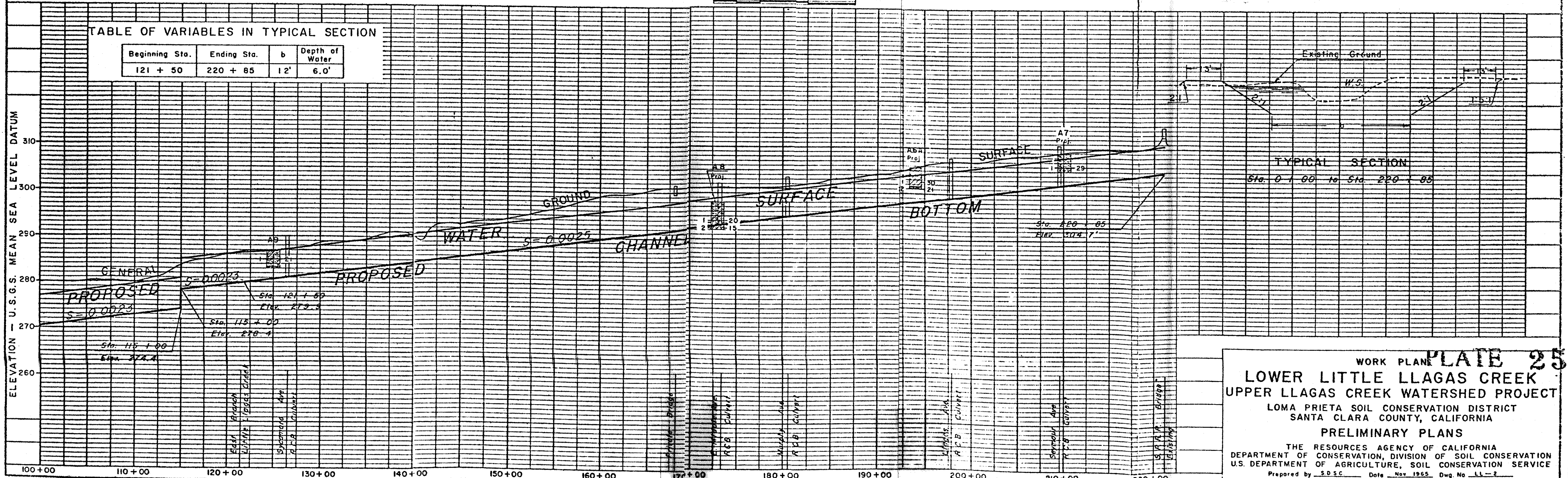
(Sample No.) 1 — NP (Non-Plastic)

- Gravelly Sand, SW
- Silty Sand, SM
- Well-Graded Sand and Gravel, GW
- Clayey Sand, SC
- Poorly Graded Sand and Gravel, GP
- Clayey Gravel, GC
- Fat Clay, CH
- Lean Clay, CL

(Sample No.) 2 — 24 (Plasticity Index)

TABLE OF VARIABLES IN TYPICAL SECTION

Beginning Sta.	Ending Sta.	b	Depth of Water
121 + 50	220 + 85	12'	6.0'



ELEVATION – U.S.G.S. MEAN SEA LEVEL DATUM
310
300
290
280
270
260
GENERAL GROUND SURFACE
PROPOSED WATER SURFACE
PROPOSED CHANNEL BOTTOM
S=0.0023
S=0.0023
S=0.0025
Sta. 115 + 00 Elev. 274.4
Sta. 115 + 00 Elev. 276.4
Sta. 121 + 50 Elev. 279.3
Sta. 220 + 85 Elev. 304.7'
A9
A8 Proj
A6A Proj
A7 Proj
East Branch Little Llagas Creek
Sycamore Ave. R.C.B. Culvert
Private Bridge
Middle Ave. R.C.B. Culvert
Murphy Ave. R.C.B. Culvert
Llagas Ave. R.C.B. Culvert
Seymour Ave. R.C.B. Culvert
S.P.R.R. Bridge Existing
Existing Ground
W.S.
3'
13'
2:1
1.5:1
b
TYPICAL SECTION
Sta. 0 + 00 to Sta. 220 + 85
100+00
110+00
120+00
130+00
140+00
150+00
160+00
170+00
180+00
190+00
200+00
210+00

WORK PLAN PLATE 25

LOWER LITTLE LLAGAS CREEK

UPPER LLAGAS CREEK WATERSHED PROJECT
LOMA PRIETA SOIL CONSERVATION DISTRICT
SANTA CLARA COUNTY, CALIFORNIA

PRELIMINARY PLANS

THE RESOURCES AGENCY OF CALIFORNIA
DEPARTMENT OF CONSERVATION, DIVISION OF SOIL CONSERVATION
U.S. DEPARTMENT OF AGRICULTURE, SOIL CONSERVATION SERVICE

Prepared by SDSC Date Nov 1965 Dwg. No LL – 2